RAILROAD GAZETTE

FRIDAY, SEPTEMBER 29, 1876.

Contributions.

The Justifiable Expenditure in Improvement in the Alignment of Railways.

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(*Continued from Page* 403.)

REDUCTION OF RISE AND FALL.

The expense of gradients arises from two causes which are totally distinct and must be kept so to form any correct estimate of their cost or of their proper adjustment.

The FIRST of these is the direct cost of ascending to or descending from any given elevation instead of running on a level; in other words, the cost of RISE AND FALL. This is the branch of the subject we now propose to consider. We shall find the objection to gradients on this account to be (comparatively speaking) very small, and to lie mainly in the greater consumption of fuel.

The SECOND objection to gradients is the effect which the MAXIMUM OR RULING grade has to increase the cost of operating the entire line (however short the ruling grade itself may be) by limiting the number of cars to a train. This objection to gradients is greatly more important than the other, but it has no real connection with it whatever, being different both in its nature and in its effect in detail on operating expenses. In fact it is not, properly speaking, an attribute of gradients at all, except that, owing to the limitations of the locomotive engine, gradients *happen* to be the *most usual* cause which limits the weight of trains. But this is not invariably so. For example, the Hudson River Railroad probably approaches the nearest to being on a dead level throughout of any railway of its length in the world; yet the locating engineer has freely introduced upon slight occasion short gradients of 15 to 25 feet per mile, which could have been avoided with slight expense; and wisely so, because the unavoidably sharp curvature of the line effectually limits the weight and length of trains to such as is easily handled by the locomotive on a considerable gradient. Up to a certain grade, therefore, curvature takes the place of gradients as a limiting agent. Had the topography of the Hudson River permitted such an alignment as that of the Canada Southern Railway, for example, which has no curvature to speak of, a very great expenditure might have been justifiable to eliminate these same gradients which have thus been freely and wisely introduced. And if at some time in the future the locomotive engine should be so improved, or such a new motor discovered, as to be able to exert an indefinitely varying power at different points of the line, at the same cost per unit of force (even if the cost per unit of force were no less than at present), all objection to both grades and curvature, except such as is *inherent* in them, viz., their effect upon wear and tear and consumption of fuel, would disappear, and they might be introduced with comparative freedom; for neither of them would then have, in addition to their own *inherent* disadvantages, the further effect of limiting the weight of trains.

This distinction is readily enough admitted in the abstract, but it is frequently confused in practice; and such a practical confusion of these two distinct problems destroys the value of many discussions and estimates on the subject of gradients, and forbids any clear understanding of their proper adjustment. The two are so totally distinct that any attempt to estimate or "equate" for both of them together prevents the attainment of any formulæ for either which will hold water under the slightest examination, and, from an unconscious neglect of one or the other of them, usually leads on the one hand to preposterous theories that "undulating gradients," or surface roads, cost little more to operate than a dead level (which in some cases, on some parts of a line, is very nearly the case), and on the other hand to equally preposterous expenditures to introduce as long and as nearly level grades as possible at all points of a line indiscriminately. The latter is an inveterate weakness of many engineers who ought to know better, and who will doubtless be the first to disclaim it. Habit has made it a second nature to reduce all grades as much and as speedily as possible and to stretch out the longest piece of thread which can be made to lie on the profile in fixing the gradients. A thousand feet further is not far on *the profile*, but it often entails a considerable expense for construction to no purpose whatever; an expense which does not *show* much, to be sure; but the money thus wasted in driblets expended at a single point would often suffice to considerably reduce the ruling grade of the line. This extremely mistaken policy is especially conspicuous in the not uncommon practice of breaking a ruling grade at the earliest possible moment and stretching it out along the hillside so much the further, instead of striking a low grade and cheap construction in the bottom lands as speedily as possible by running down into the valley on the maximum grade. If there was room here for some miles of profile, the writer might adduce a brilliant example of this wise procedure on a recently constructed railway in Western New York. A certain amount (and a very small amount) of expenditure is always justifiable to reduce the rate of any grade, even although it may be less than the rate of the maximum grade. We shall find out this amount in the course of the present article, but it is far too small to justify any considerable difference in cost of construction.

We propose, then, to consider for the present the cost of RISE AND FALL *only*. This cost is, approximately speaking, directly as the vertical elevation attained and independent of the *rate* of grade. The expense arising from the MAXIMUM OR RULING GRADE, on the contrary, is directly as the rate of grade and nearly independent of its length or of the vertical elevation reached.

DEFINITION OF "ONE FOOT OF RISE AND FALL."

Every foot of rising grade involves a corresponding descent at some other point on the line, except the difference of level in the termini, if there be any. In the former case a train, in going and returning, passes over two feet of ascent and two feet of descent for every foot of elevation attained, and we shall understand by the term "one foot of rise and fall" such a foot of elevation or summit, which involves both an ascent and descent in every trip. In the case of the difference of level in the termini, a train, in going and returning, passes over but *one* foot of ascent and one foot of descent for every foot of elevation attained, instead of two, and hence the cost will be only half as great. It will be obvious, therefore, that we may compare any two lines in respect to rise and fall by simply taking the feet of ascent and descent indiscriminately from the profile and dividing the same by two to determine the feet of rise and fall. No separate estimation of rise and fall in opposite directions is at all necessary, nor any consideration of the rate of ascent or descent, unless minute accuracy is desired. Certainly this is not necessary for comparing two approximately similar lines.

To estimate the cost of rise and fall, as in estimating the cost of curvature, we must, FIRST, determine the number of feet of rising grade which opposes a resistance equal to one mile of level track; and, SECONDLY, the increased expense arising from such resistance.

AMOUNT OF RISE AND FALL EQUAL IN RESISTANCE TO ONE MILE OF LEVEL TRACK.

An approximate solution of the first problem is easily reached. It is evidently given by the number of feet per mile in the grade on which a train will just maintain its motion at a given speed, assisted by gravity alone; in other words, what is termed the angle of friction. The accelerating force of gravity is given by the formula—

$$\frac{\text{rate of grade per mile}}{5{,}280} \times 2{,}000.$$

The retarding force of the rolling friction is, by the formula of D. K. Clark, generally accepted for lack of a better,

$$\frac{v^2}{171} + 8,$$

in pounds per ton of 2,240 lbs., v representing the velocity in miles per hours; or, per ton of 2,000 lbs. we may approximately enough adopt the form

$$\frac{v^2}{200} + 7.3$$

as a sufficient approximation*. Forming an equation between these two formulæ, we shall obtain (see also Vose's Manual, p. 43), at a speed of 15 miles per hour, something over 22 feet per mile as the grade offering a double resistance, and, at a speed of 30 miles per hour, something over 31 feet. For an average business of two passenger trains to one freight train, we should have an average speed of 20 miles per hour and a grade of something less than 25 feet per mile as the grade opposing a resistance to trains equal to that of one mile of level track, and we may adopt this as our standard. It corresponds to an average rolling friction of about 9.3 lbs. per ton.†

INCREASE IN OPERATING EXPENSES FROM RISE AND FALL.

Fuel.—The cost of fuel, which we have hitherto considered first, we will take up after determining the effect of rise and fall on the other operating expenses.

Repairs of Engines and Cars.—That the increase in repairs of rolling stock is a very small one, per 25 feet of rise per mile, is evident from the statistics given in Table XI. in the article on curvature, showing the cost of running engines for a series of years on the several divisions of the Pennsylvania Railroad. No appreciable effect on the cost per mile run of repairing engines is visible in the statistics of the separate divisions, which differ greatly in respect to grades and curvature. As there are long and heavy grades in the mountain divisions of that road, conjoined with heavy curvature, there should certainly be *some* difference perceptible if the effect of such grades and curves on these items were of much importance. Undoubtedly the increased wear is compensated for in some degree by lesser speed and more careful handling, but as this costs the company nothing except the slight delay, we may fairly allow it as an offset to some extent; and even without doing so an estimate of 5 per cent. increase in the total cost per mile of repairs of rolling stock, for each 25 feet of ascent, and the same on the corresponding descent, is probably ample. On 100 feet grades this would amount to 20 per cent. per mile of ascent, or, taking an average of the mountain divisions of the Pennsylvania Railroad, a difference of at least 15 per cent. should be visible, whereas in fact there is none at all which is clearly due to the alignment. On the Baltimore & Ohio Railroad the difference in the cost per mile of running engines should be at least 20 per cent., but the writer is informed that there is no such difference, even without allowing for the heavier class of engines employed on the mountain divisions, for which the expense should properly be somewhat greater. In this connection (and also in respect to the wear of rails on grades), we may also refer to the testimony of the eminent English engineer, Mr. Charles B. Vignoles, already quoted under the head of curvature.

Wear of Rails and Track.—The effect of grades on the wear of rails is greatly exaggerated in popular belief, for want of a proper distinction between the effect of a heavy *ruling* grade, on which the number of trains is increased, and the effect of rise and fall simply, on which the number of trains is the same as on adjacent pieces of level track. We shall see reason to believe that in the latter case the effect of gradients on wear of rails is very slight.

Tables XII. and XIII., in the chapter on reduction of curvature, giving statistics of the renewals of rails on the Erie Railway for a long period of years, afford one evidence of this. By reference to the tables it will be seen that, neglecting any effect from the difference in gradients, the increased wear of rails due to curvature on miles 39 and 40 amounted to the very large percentage of 16 per cent. per degree of average curvature over mile 38, which is nearly straight, but on a descending gradient of 45 feet per mile, whereas on miles 39 and 40 the grades were very light. Now if the higher grade on mile 38 had the effect of increasing the wear of rails to any considerable extent, say by as little as 10 per cent. for example, this already large percentage would have to be increased by from ¼ to ⅓; or, instead of 16 per cent., the wear of rails from curvature would be as much as 20 to 24 per cent. per degree of average curvature, which would certainly seem to be very excessive. We may show the effect of such an allowance for wear on grades in a little table, as follows:

Mile.	38	39	40
Alignment.....	Tangent.	4°24′ reversed curvature.	2°22′ reversed curvature.
Gradients.....	45 ft. per mile.	11 ft. per mile and level.	Undulating, 20 and 30 ft., and level.
Average yearly renewals.	3,356 feet.	5,696 feet.	4,396 feet.
Percentage of increased wear due to curvature.	.....	70 per cent.	31 per cent.
If we allow the wear of rails on mile 38 to have been increased by 10 per cent. over miles 39 and 40 on account of the steeper grade, the yearly renewals on mile 38 would have been (except for the grade) only.....	3,020 feet.	.....	.....
Consequently, the increased wear due to curvature on miles 39 and 40 would have been.....	.....	88 per cent.	46 per cent.
Or, the apparent effect of curvature on the wear of rails would be increased by about....	.....	¼	½

The very heavy grades (105 and 116 feet per mile), and large traffic of the Baltimore & Ohio Railroad, afford an admirable test of this question, and to a letter of inquiry as to the difference in the life of rails, and in the total increased cost of "Repairs of Railway" (or maintenance of road-bed and track), observed on the heavy grades of that road in comparison with level track sustaining the same engine mileage, the writer received the following reply (from Mr. W. N. Bolling, Engineer of Bridges and Permanent Way):

"'1. What difference in the life of the same quality of rails has been observed on your 105 and 116 feet grades compared with level track sustaining the same engine mileage?'

"The observations on steel rails have not been continued through such a term of years as to state definitely the difference; so far as observed, the difference is slight. With iron rails, the difference was—say 20 to 25 per cent. The conditions of use were different, however. The wear incident to grade is compensated for, in great measure, by reduced speed as compared with levels, and by a firmer road-bed, on account of better drainage.

"'2. At what would you estimate the total increased cost of "Repairs of Railway" on your heaviest grades, compared with light grades or levels sustaining the same engine mileage?'

"There is but slight increased cost of repairs of railway attributable to grade, especially with steel rails. The increased cost on the heavy grades is incident to their location and not to rail wear."

In respect to the distinction in the latter paragraph it will appear, at first sight, that the use of steel or iron rails does not affect the *relative* cost of rail renewals on gradients, but consideration will show the point to be well taken. Thus, supposing the life of rails on a 105 feet grade to be only half as great as on a level. Owing to the long life of steel rails, the interest on their cost would, in their case, eat up more than half of this difference. The closing distinction in the above quotation also is one that should be kept in mind in considering the relative cost of heavy grades. Such grades are usually located in rugged and difficult country, and the increased expense arising from *that* cause is very apt to be attributed to the effect of the gradients themselves.

As operating against these facts, which tend to diminish the importance of the effect of gradients on the wear of rails and track, we will now consider the widely quoted facts as to the relative wear of rails on grades and levels on the Great Northern Railway of England, which are given in the able and elaborate paper of Mr. R. Price Williams before referred to, ("Maintenance and Renewal of Permanent Way," Proc. Inst. Civ. Engrs., Vol. XXV., 1866). The gist of Mr. Williams' argument

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* Exactly, Clarke's formula becomes, for tons of 2,000 lbs.,

$$\frac{v^2}{181.52} + 7.14.$$

To correspond with the above approximation the original formula should have been, for tons of 2,240 lbs.,

$$\frac{v^2}{178} + 8.16.$$

Very slight objection can reasonably be made to such a difference. The "171" of the formula is rather an absurb refinement.

† As we have adopted 600° of curvature and 25 feet of rise and fall as each equal in resistance to one mile of level track, it follows that 1° of curvature should be equal in resistance to 0.042 feet of rise and fall $\left\{\frac{25}{600} = 0.0417\right\}$, which should accordingly be the average reduction in grade per station per degree of curvature necessary to compensate for the resistance of curves. Professor Vose's formula, in the "Manual for Railroad Engineers," require 0.046 per degree of curvature for this reduction; the ordinary allowance in practice (according to the writer's experience) is 0.05; and the experiments of Mr. Charles Ellet on 296 feet grades and 19° curves (300 ft. radius) would indicate nearly 0.1 per station as the requisite reduction per degree of curvature on such grades, or nearly 0.06 with oiled flanges and specially designed tank engines. Our estimate thus appears low, and probably is less than a proper allowance for this purpose; but it does not follow that the resistance of curvature has been under-estimated or that of gradients over-estimated. What we require for our present purpose is a *fair average* for all trains and all conditions of track, but in reducing grades for curvature the reduction should be sufficient to compensate for the resistance with the longest trains and under the most unfavorable circumstances.

as to the wear of rails on grades is embodied in the following statement; that the same rails on a down grade of about 42 feet per mile were renewed in three years, after sustaining a traffic of only 65,500 trains or 13,500,000 tons, whereas at another point of the line, on a level, they were renewed only after 7¾ years, having sustained the traffic of 203,000 trains or 38,800,000 tons. In another part of the paper Mr. Williams gives statistics for a similar up grade at a third point on the line, showing that rails of the same quality were still sound after sustaining the traffic of 119,500 trains ar 24,700,000 tons. From these statistics Mr. Williams concludes that the wear of rails is considerably increased on grades and is very much greater on down grades than on up grades.

If there were no other contravening facts, these statistics, critically examined, prove too much. It is altogether incredible that there should be any such difference as 312 per cent. $\left(\frac{203{,}000}{65{,}000}\right)$ in the wear of rails on a level and on a 42-feet grade. Such a difference would require the 116-feet grades of the Baltimore & Ohio Railroad to wear out rails 8 or 9 times as fast as on adjacent lines $\left(312 \text{ per cent.} \times \frac{116}{42} = 862 \text{ per cent.}\right)$, and would bankrupt half the high-grade railways of the world. If we consider further that the whole argument of the paper on this point is based upon the statistics of a single renewal at widely separated points of the line, it will appear *prima facie* that this affords rather an insecure basis for such important deductions, and that the very great differences reported might have been and probably were caused, or at least assisted, by external causes. So far as the asserted greater wear on the down incline is concerned, the concluding discussion to the paper itself affords conclusive evidence that this is the case, and as the facts and deductions of the paper in this respect have been widely reprinted and accepted, and contravening facts in the discussion apparently overlooked entirely (*e. g.*, see Vose's "Manual for Railroad Engineers," Appendix on Wear of Rails), it will be well to reprint the following extract in full from the discussion on Mr. Williams' paper:

"MR. T. E. HARRISON.—As to the asserted additional wear of the rails on a down incline, no doubt when running down an incline the rails have a tendency to go down the incline themselves. But having lately examined the diagrams—which have been kept for many years and were similar in principle to those exhibited—showing the wear of rails and the dates at which they were renewed on every portion of the Northeastern Railway, he found that though on some of the inclines (the steepest being 1 in 120) there was a slight difference in the wear of the down line, yet it was so slight that he thought the increased wear in the down incline on the Great Northern Railway could not be attributed to the fact of its being on an incline, but it appeared to him to be owing to the much heavier weight of the traffic to London, including the whole of the large mineral traffic. There was a further cause which, on the Great Northern Railway, might have had the same effect, viz.: the repeated stoppages of trains which he had noticed, at the very numerous tunnels, in descending to London." (Proc. Inst. Civ. Eng'rs, Vol. XXV., p. 413.)

In a case of this kind negative testimony is of more value than positive, since a theory if sound will agree with *all* the facts, and hence this testimony completely oversets the theory of a greatly increased wear on down inclines. We have left then, out of the statistics given in Mr. Williams' paper, only the fact that rails worn out on a level by the passage of 38,000,000 tons were *not* worn out, at the date of the paper, by the passage of 24,700,000 tons on an up grade at another point on the line. This affords a very small basis for a high estimate of the wear of rails on grades, even if the statistics were not affected by any of the exterior causes which we see must have necessarily operated in the other case.

Taking all these facts which have been given into consideration, it would appear to be a fair estimate to allow 5 per cent. per 25 feet of rising grade, and the same on the corresponding descent, or 10 per cent. for each 25 feet of RISE AND FALL, as the increased cost of wear of rails, and the same allowance as the increase in the aggregate cost of maintenance of road bed and track. On a 100 feet grade this would give a difference of 20 per cent. in the aggregate of these items.

We have, then, besides the additional cost for fuel, the following as the increased cost per train mile arising from 25 feet of rise and fall:

	Total cost of item at $1.00 per train mile.	Proportion of same increasing with rise and fall.	Cost per train mile of 25 feet of rise and fall.
Repairs of engines and cars	19 cts.	5 per ct. × 2	2 cts.
Maintenance of rails, road bed and track	20 "	5 " × 2	2 "
Train wages, maintenance of yards and structures, and station, terminal and general expenses	49 "	unaffected.	
Total, excluding fuel and oil	88 cts.		4 cts.

We will now consider the effect of rise and fall on the consumption of fuel.

Fuel.—Under the head of curvature we have seen that only about 60 per cent. of the consumption of fuel is directly in proportion to the power demanded after the train is once in motion, the remaining 40 per cent. being consumed while getting up steam, standing idle, stopping and starting, and in supplying the waste from radiation, which is very nearly the same whatever the pressure or the amount of steam passing through the cylinders in a given time. As the conditions are precisely the same in the case of rise and fall, we may assume that the consumption is increased by only 60 per cent. of the average consumption per mile by every 25 feet of ascending grade. In other words, if the total average consumption in running a given distance on a level were 10 tons, it would be only 16 tons if it were a continuous ascending grade of 25 feet per mile, which requires a double expenditure of power. We may also assume that this increased consumption is the same per foot of ascent whether the rise be concentrated on one mile or spread over ten; it being understood of course that we are not now considering the effect of such grades as demand an expenditure of power beyond the capacity of the engine, thus carrying us into the subject of maximum or ruling grades.

In descending the same gradient the conditions are different. In descending a 25-feet grade (which we have assumed to be just sufficient to keep the train in motion without the aid of steam) we regain in theory the whole increased consumption of power or fuel on the corresponding ascent, but practically only about two-thirds of this amount, the remaining third going out of the chimney or safety valve when the engine is not using steam. But, in the words of Vose's Manual, "if the grade be ten times steeper, we do no more," the additional momentum of the train being simply taken up by the brakes and lost. Accordingly we see that there is a certain inherent disadvantage in a high grade as compared with a lower one, independent of the effect of grades as a limiting agent to the weight of trains. This becomes evident in the following table:

RATE OF GRADE PER MILE.	25	37½	50	75	100	125
Increase in cost of fuel per mile, ascending	6 cts.	9 cts.	12 cts.	18 cts.	24 cts.	30 cts.
Saving in cost of fuel per mile, descending	4 "	4 "	4 "	4 "	4 "	4 "
Net increase in cost of fuel, per mile of ascent and corresponding descent	2 cts.	5 cts.	8 cts.	14 cts.	20 cts.	26 cts.
Increase per train mile in other expenses (as previously determined), at 4 cts. per 25 feet of rise and fall)	4 "	6 "	8 "	12 "	16 "	20 "
Total increased cost per train mile	6 cts.	11 cts.	16 cts.	26 cts.	36 cts.	46 cts.
Equal to a total increased cost per train mile, *per 25 ft. of rise and fall*, of	6 "	7⅓ cts.	8 "	8⅔ "	9 "	9.2 "

Thus we see, by the last line of the above table, that there is a slight increase in the cost of rise and fall on higher grades, but the difference—due entirely to the greater waste of power in descending them—is a refinement of little real importance (except perhaps in one respect, which we shall briefly consider below), and in discussions of the subject this difference has usually been neglected altogether. Thus in *Engineering* (Feb. 5, 1869), we find the general rule laid down that "descending gradients may be considered equivalent in cost of working to a level line," thus balancing the saving of fuel against the wear and tear of road bed and rolling stock, whatever each may be; and in Vose's "Manual for Railroad Engineers" (p. 44) we find a similar statement. But it is evident that as the wear and tear increases with the grade and the saving of fuel is constant, this is not strictly correct, although the hypothesis has the convenient effect of making the cost of rise and fall independent of the rate of grade. As the effect of the rate of grade is shown in the above table to be relatively much less on the higher grades, we may, for the purpose of location estimates, assume an average of 8 cents per train mile as the cost of 25 feet of rise and fall on all grades higher than 40 feet per mile; noting the percentage of difference on higher and lower grades, which we shall determine below.

Expressing this amount, 8 cents per mile per 25 feet, in the form of *the yearly cost per daily train of one foot of rise and fall*, we have, allowing 325 days in the year, and multiplying by two for the round trip,

$$\$0.8 \times 325 \times 2 \div 25 = \$2.08.$$

This amount, divided by the rate of interest on capital, 0.6, 0.7, etc., gives the values given in the first column of Table C, below.†

In the case of projected improvements in the alignment of railways already in operation, for which exact statistics of expenses may readily be determined, we may also express the cost of one foot of rise and fall as follows:

The cost per train mile of one foot of rise and fall is $\$0.08 \div 25 = \$0.0032$. Then the yearly cost of operating one foot more or less of rise and fall is

$\frac{0.32}{100}$ or 0.0032 times the average yearly TOTAL EXPENSES per mile of road.

$\frac{0.32}{70}$ or 0.0046 times the average yearly "transportation" or "line" expenses per mile.

$\frac{0.32}{10}$ or 0.032 times the average yearly cost of fuel per mile.

The amounts, or percentages, last given above, multiplied by the average yearly expenditure per mile for the items opposite to it, give the total yearly cost of operating one foot of rise and fall, and divided by the rate of interest on capital, give the capitalized value of saving one foot of rise and fall. We thus obtain the last three columns of Table C.

†The writer is well aware that this estimate of the cost of rise and fall will seem very small in comparison with some others. Thus, in Vose's "Manual for Railroad Engineers" the estimate of increased cost from a double resistance, for grades of 25 feet or less, is one-sixth, or 16⅔ cents per mile, instead of 8 cents above. Most of this difference is accounted for by the fact that Professor Vose's estimate is based on the Massachusetts Reports, where the cost of fuel is 12 per cent., and by the fact that the whole cost of fuel is considered in the "Manual" as doubled on a grade of double resistance, thus making the increased cost of fuel in ascending 12 cents instead of 6 cents, as by our estimate. There remains, however, a balance of 4⅔ cts. per mile plus the saving in fuel in descending, which we have estimated at 4 cents, as an allowance for wear and tear, for which we have estimated but 4 cents in all. On the higher grades Professor Vose's estimates would exceed those we have given in much greater proportion. The writer can only frankly admit that these differences are irreconcileable and express his belief that the estimates here given are sufficiently large for the *direct* effect of gardients as sources of expense, when the entirely distinct question of their effect as limiting agents on the weight of trains is not mixed up with it. It is difficult to resist the tendency, in such estimates as these, to err by *overestimating*, as it is proper to do in nearly all estimates which an engineer is called upon to make, but consideration will show that in this case the errors should all lean to the conservative side.

VALUE OF REDUCING THE RATE OF GRADIENTS ON OTHER THAN RULING GRADES.

We have seen above that, owing solely to a greater economy of fuel in descending on moderate gradients, there is a certain slight inherent disadvantage in a high rate of grade, independent of the effect of the *highest* rate of grade as a limiting agent to the weight of trains. The difference is too slight to be of much real importance, but lest the nature and effect of such difference as there is be misapprehended and exaggerated, we may briefly consider it.

The following table summarizes, in the briefest and most convenient form, the results we desire to reach:

1. RATE OF GRADE IN FEET PER MILE.	12½	25	37½	50	75	100	125
2. RATE OF GRADE IN FEET PER STATION.	.24	.48	.71	.95	1.42	1.90	2.37
3. Cost, in cents, per train, of 25 feet of rise and fall on each grade (as already determined above)	(4.)	6.	7.33	8.	8.67	9.	9.2
4. Percentage which the cost per 25 feet on each grade forms of 8 cents, assumed for the standard of Table C	.50	.75	.915	1.00	1.085	1.125	1.15
5. Difference between the percentages of cost on each grade	.25	.165	.085	.085	.04	.025	
6. Difference in the rate of grade per station, in feet	.24	.23	.24	.47	.48	.47	
7. Dividing the first of these two differences by the second, we deduce the value per vertical foot of a reduction of 0.1 PER STATION in the rate of any grade, in the form of a percentage on the value of 1 foot of rise and fall which is given in Table C, as follows	.104	.072	.036	.018	.008	.005	

The fourth line of this table gives the percentages by which, if strict correctness is desired, the values given in Table C must be corrected in estimating the cost of rise and fall on different grades. These percentages are given—in round figures—immediately below Table C, but they are of importance, as appears to the writer, only as showing the very slight cost of rise and fall on low gradients, 0.5 or less per station, and except in that respect may, for all practical purposes of location, be neglected altogether; the cost of rise and fall on higher gradients being estimated at so much per vertical foot, independent of the rate of grade.

The seventh and last line of the above table shows the value of *reducing* the rate of grade on other than ruling gradients, which are also given, in round figures, at the foot of Table C. They are given less on account of their importance than to definitely illustrate the unimportance of such reduction of minor gradients.

The above table sufficiently explains itself and the method of obtaining these percentages, except that the cost given, in the third line, for 25 feet of rise and fall on a grade of 12½ feet, has not previously been determined. On such a grade steam must be used both in ascending and descending and there can hardly be said to be any increased cost of fuel, all power lost in ascending being saved in descending. At least, such slight loss as there is will be fully covered if we estimate the wear and tear of track and rolling stock at the same rate per 25 feet of rise and fall as on higher gradients (*i. e.*, at 4 cents per train). We thus obtain 4 cents per 25 feet—only half of the cost on a 50 feet gradient—as the cost of rise and fall on a 12½ feet grade.

TABLE C,

SHOWING THE CAPITALIZED VALUE OF SAVING ONE FOOT OF RISE AND FALL ON GRADIENTS OVER 40 FEET PER MILE AND NOT EXCEEDING THE RULING GRADE, ASSUMING A TOTAL COST PER TRAIN MILE OF $1.00.

RATE OF INTEREST ON CAPITAL.	PROJECTED LINES. For each estimated daily train (round trip) over the line.	PROJECTED LINES. For each estimated $1,000 of yearly expenditure per mile.	RAILWAYS IN OPERATION. Multiply the average annual expenditures per mile for either of the following items by the number given below it, opposite the proper rate of interest. All "transportation" or "line" expenses.	RAILWAYS IN OPERATION. Fuel only.
5 per cent.	$41 60	$64 00	.092	.64
6 " "	34 67	53 33	.076	.53
7 " "	29 71	45 71	.067	.46
8 " "	26 00	40 00	.057	.40
10 " "	20 80	32 00	.046	.32
YEARLY COST of 1 ft. of Rise and Fall	$2.08	$3.20	.0046	.032

REMARKS.—These values are strictly correct only for gradients of about 50 feet per mile. To estimate the cost of rise and fall on other gradients with greater exactness, the values given above should be corrected by the following percentages:

On 12½ feet per mile grades, 50 per cent. less than the above.
" 25 " " " " 28 " " " " " "
" 35 " " " " 10 " " " " " "
" 80 " " " " 10 " " more " " "
" 125 " " " " 15 " " " " " "

VALUE OF REDUCING THE RATE OF MINOR GRADIENTS.

On a rate of grade per station of	A reduction of .1 per station in the rate of grade is worth (per vertical foot)
Less than 0.5	10 per cent. of the values given in Table C
0.5 to 0.7	7 " " " " " " " " " "
0.7 " 1.0	4 " " " " " " " " " "
1.0 " 1.4	2 " " " " " " " " " "
Greater than 1.4	1 " " " " " " " " " "

For example, to reduce any ascent of 200 feet from the rate of 0.5 per station to the rate of 0.3 (with a ruling grade of say 0.8 per station) is worth 7 + 10 + 10 = 27 per cent. of the value given in Table C. Then at 6 per cent. the value per daily train would be $34.67 × 200 × 27 per cent. = $1,872.18, or, for an estimated business of 10 trains daily, $18,722.

"EQUATING" FOR RISE AND FALL.

The yearly cost per daily train of 1 additional mile of distance has been previously determined as $273 00
The corresponding cost per daily train of 1 additional foot of distance is $0.0517

The yearly cost per daily train of 1 foot of rise and fall, measured by the same standard, we have determined to be..... $2 08

Then it follows that one mile of distance is equivalent to 131 feet of rise and fall—

$$\left\{\frac{\$273.00}{\$2.08} = 131\right\}$$

and one foot of rise and fall is equivalent to 40 feet of distance—

$$\left\{\frac{\$2.08}{\$0.0517} = 40+\right\}$$

Under the head of curvature, we have already determined 1,120° of curvature to be equivalent to 1 mile of distance. Hence, one foot of rise and fall is also equivalent to 8.5° of curvature—

$$\left\{\frac{1{,}120°}{131} = 8.5°\right\}$$

These equating formulæ are given mainly for purposes of comparison with others, as, if we may use definite money values instead of them, such rules are as clumsy a contrivance as a process of barter in comparison with a currency.

PRACTICAL EXAMPLES OF ESTIMATING FOR RISE AND FALL.

As a practical example of the application of Table C, we may take the following example from Vose's "Manual for Railroad Engineers" (p. 43).

Let us suppose we have two lines, AB, 100 miles long, and CD, 96 miles long; differing in their gradients as shown in the following table, the sign + signifying an ascending grade in going from A to B or from C to D, and the sign — a descending grade. In the third column is given the total amount of ascent or descent on each grade, and the *sum* of these ascents and descents, divided by 2, gives the total number of feet of rise and fall on each line:

LINE AB—100 MILES. DISTANCE.	Rate of grade in feet per mile.	No. of feet of rise or fall.
30 miles.....	+50	1,500
20 "	—20	400
10 "	+60	600
15 "	—15	225
15 "	+20	300
10 "	—40	400
100 miles.....	Total.	3,425

Ruling grade, going from A to B..... 60 ft.
Ruling grade, going from B to A..... 40 ft.
No. of feet of rise and fall..... $\frac{3{,}425}{2} = 1{,}712.5$.

LINE CD—96 MILES. DISTANCE.	Rate of grade in feet per mile.	No. of feet of rise or fall.
20 miles.....	+60	1,200
10 "	—20	200
15 "	+30	450
15 "	—15	225
26 "	+30	780
10 "	—50	500
96 miles.....	Total.	3,355

Ruling grade, going from C to D..... 60 ft.
Ruling grade, going from D to C..... 50 ft.
No. of feet of rise and fall..... $\frac{3{,}355}{2} = 1{,}677.5$.

To compare these lines in terms of the cost per daily train, we have (assuming the rate of interest on capital to be 7 per cent.):

In favor of line C D, 35 feet of rise and fall, @ $29.71 per foot.....	$1,039 85
In favor of line C D, 4 miles distance, @ $3,900 per mile..	15,600 00
Total value of line C D over line A B, per daily train....	$16,639 85

Per contra, we have, in favor of the line A B, a ruling grade 10 feet lower in going from B to A than in going from D to C. The value of this difference, if any, would depend on the relative weight of trains in each direction, and we are not now prepared to estimate it. It might be of much importance, or it might be of none whatever.

"Equating" these same lines, we have:

Difference in rise and fall in favor of CD, 35 feet, = 0.267 miles,

$$\left\{\frac{35}{131} = 0.267\right\}$$

" " measured length " " 4.000 "

Total "equated" difference of length, in favor of C D..4.267 "

Then, 4.267 miles × $3,900 = $16,641.30, as the value per daily train of line C D over line A B, the same as before, barring a slight difference from neglect of decimals.

This example is worked out in the "Manual" with a result precisely the reverse of that we have obtained above. That is to say, the gradients of the two lines are made to show a balance in equated distance of 1.37 miles in favor of A B instead of 0.36 miles in favor of CD. Without going into details, this result is due to the fact that, as appears to the writer, the rules of the "Manual" confuse the question of rise and fall with that of ruling grade, to the destruction of their value as a guide in either case. We may conclusively show this, as it happens, by an illustration which will also serve us as a practical example in considering our next subject.

Let us take the line A B, and instead of the undulating and irregular profile shown in the table above; let us suppose the same amount of ascent and descent to be concentrated entirely at each end of the line on the same ruling gradients. We should thus obtain the following profile:

	Line A B, with revised profile.	
40 miles.	rising 60 feet per mile.....	2,400 feet ascent.
34.38 "	level.	
25.62 "	falling 40 feet per mile	1,025 feet descent.
100.00 miles.	Totals (same as before)	3,425 feet.

"Equating" these two lines according to the rules of the "Manual," we obtain the following singular result:

	Line A B, with the original gradients.	Line A B, with revised profile shown above.
Equated length, going from A to B.....	123.15 miles.	120.63 miles.
Equated length, going from B to A.....	107.56 "	112.64 "
Mean equated length.	121.14 "	115.35 "

In other words, the difference in gradients is made to appear as equivalent to nearly six miles of distance in favor of the undulating profile, yet the revised profile is, in comparison with the other, an admirable system of gradients, rendering possible a very great economy in operating expenses with any considerable business, and worth many thousands of dollars more than the other for a very moderate business. How much more, we shall endeavor to determine hereafter, in considering the adjustment of gradients.

[TO BE CONTINUED.]

Erecting Locomotive Guide Bars.

PROVIDENCE, Sept. 26, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your "Directions for Erecting Locomotive Guide Bars," might do in some shops or in some cases, but there is no builder that I am aware of but does or should build all parts of a locomotive and assemble them in the erecting shop on the plan that guns and watches are made, and with less trouble. Do you not think the time of building locomotives by scribe rule is over? PRACTICE.

Street Railroad Locomotives.

Offices of Porter, Bell & Co., Builders of Light Locomotives,
PITTSBURGH, Pa., Sept. 26, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We notice in your issue of the 22d, a very clear statement in the editorial columns of the advantage of the use of steam on street railroads. If our experience in this direction is of any use to you, you are welcome to it.

We have built a number of our light locomotives for this service with very satisfactory results. The New Orleans City Railroad is using our 8×16 engines with four 40-inch drivers and two-wheel pony truck, rigid wheel base 5 ft. 9 in., and weight about 10 tons. The same road is using our 7×12 in. engines four 30-inch drives and no truck; wheel base 4 ft. 8 in.; weight about 7 tons. These engines are inclosed in imitation of street cars, and give no trouble from noise or smoke, and the larger size is capable of a speed of 30 miles per hour, and the smaller of 20 miles with a light load; the usual speed is about 10 miles. These engines haul from 6 to 10 crowded street cars, and on this road, which is almost a dead level, could haul twice as many. We have also built for street railroads where the grades are as steep as 250 ft. per mile, and find that locomotives are just as preferable to horses on steep grades as on level. The smallest size we have built is 6×10 in. cylinders, weight about 5 tons. We entirely agree with you that for this service a combined car and engine is not so good as a separate locomotive, and also believe that such a locomotive, however small, should be built as thoroughly as a large road engine, and even with more care, as the service is usually very hard, on account of sharp curves, steep grades, rough track and mud and dust. PORTER, BELL & Co.

Master Mechanics' Association—Circular on Locomotive Tests.

DEAR SIR: The undersigned, a committee appointed at the annual convention of the American Railway Master Mechanics' Association to report on the subject of "Locomotive Tests," respectfully desire the co-operation of members of the Association in furnishing to them any record of tests they have made, or may make prior to next annual meeting.

1st. Comparative tests of several classes or kinds of locomotives, as to number of cars hauled by each class, giving weight and dimension of each class; pressure steam carried; kind and quantity fuel consumed; miles run; kind of exhaust, single or double nozzle; diameter nozzle; condition of road, grades, curves, etc.

2d. Have you made any tests in burning fuel in locomotives; and what kind gives best results as regards economy? State whether plain fire-box, water-table or brick arch was used. If convenient, please give sketch of same, including stack and arrangement in smoke-box.

3d. Give results of any tests of a general character that will be of interest and value to the Association.

The Committee desire the members to give the Association the benefit of their experience relative to the above subject, that it may be placed on record for reference. A blank form is here appended, in which the weight and dimensions of engines can be conveniently entered.

Very respectfully,
WM. WOODCOCK,
Master Mechanic, Central Railroad of New Jersey,
S. A. HODGMAN,
Master Mechanic, Philadelphia, Wilmington & Baltimore Railroad,
DAVID CLARK,
Master Mechanic, Lehigh Valley Railroad,
Committee.

Please address your replies to WM. WOODCOCK, Master Mechanic, Central Railroad of New Jersey, Elizabeth, N. J.

Born in a Tunnel.

A somewhat unusual occurrence took place on an Erie train a few days since as it was passing through the Bergen tunnel. When the train came out into daylight again it was found that there was one more passenger than when it entered the tunnel, and the new arrival was unprovided with ticket, baggage, or even clothing of any description. The youthful dead-head, however, was carried through to Jersey City and the grateful mother, who is of the colored persuasion, promised to name him "Receiver Jewett Brown."

RAILROAD EARNINGS IN AUGUST.

Name of Road.	Mileage. 1876.	1875.	Inc.	Dec.	Per c.	Earnings. 1876.	1875.	Increase.	Decrease.	Per c.	Earnings per Mile. 1876.	1875.
Atchison, Topeka & Santa Fe	711	508	203	.....	40.2	$231,549	$151,823	$79,726	.....	52.5	$326	$299
Baltimore & Ohio	1,288	1,288	.....	.....	.....	1,259,143	1,216,122	43,021	.....	3.5	978	944
Cairo & St. Louis	146	146	.....	.....	.....	26,082	23,874	2,208	.....	9.2	179	164
Canada Southern	452	452	.....	.....	.....	148,968	104,037	44,931	.....	43.2	330	230
Central Pacific	1,315	1,315	.....	.....	.....	1,689,000	1,553,014	135,986	.....	8 8	1,284	1,181
Chicago & Alton	650	650	.....	.....	.....	494,272	411,960	82,312	.....	20 0	760	634
Chicago, Milwaukee & St. Paul	1,400	1,399	1	.....	.....	569,482	630,516	.....	$61,034	9.7	407	451
Cincinnati, Lafayette & Chicago	75	75	.....	.....	.....	33,908	32,743	1,165	.....	3 6	452	437
Cleveland, Mt. Vernon & Del	157	157	.....	.....	.....	33,497	34,400	.....	903	2.6	213	219
Columbus & Hocking Valley	89	89	.....	.....	.....	67,977	70,109	.....	2,132	2.9	764	788
Denver & Rio Grande	206	120	86	.....	71.7	44,449	32,761	11,688	.....	35.6	216	273
Illinois Central	1,109	1,109	.....	.....	.....	595,100	613,446	.....	18,346	3.0	537	553
Indianapolis, Bloomington & Western	344	344	.....	.....	.....	138,275	07,108	31,167	.....	29.1	402	311
International & Great Northern	459	459	.....	.....	.....	85,384	79,467	5,917	.....	7 4	186	173
Kansas Pacific	764	761	23	.....	3.0	254,788	305,139	.....	50,351	16.5	325	401
Louisville & Nashville	738	738	.....	.....	.....	402,489	3?5,718	46,771	.....	13.1	545	482
Michigan Central	804	804	.....	.....	.....	542,772	527,744	15,028	.....	2.8	675	656
Missouri, Kansas & Texas	786	786	.....	.....	.....	294,360	270,932	23,428	.....	8.6	375	345
Nashville, Chattanooga & St. Louis	341	341	.....	.....	.....	131,103	137,930	.....	6,827	5.0	384	404
Ohio & Mississippi	615	615	.....	.....	.....	292,898	257,771	35,127	.....	13 6	476	419
Paducah & Memphis	115	115	.....	.....	.....	15,703	17,207	.....	1,504	8.7	137	150
Philadelphia & Erie	288	288	.....	.....	.....	267,834	333,429	.....	65,595	19.6	930	1,158
St. Louis, Alton & Terre Haute—Belleville Line	71	71	.....	.....	.....	35,113	40,444	.....	5,331	13.2	495	570
St. Louis, Iron Mountain & Southern	685	685	.....	.....	.....	288,300	283,957	4,343	.....	1.5	421	415
St. Louis, Kansas City & Northern	504	504	.....	.....	.....	255,688	248,836	6,852	.....	2.8	507	495
St. Louis & Southeastern	349	349	.....	.....	.....	104,845	73,613	31,232	.....	42.4	300	211
St. Paul & Sioux City	122	122	.....	.....	.....	44 081	44,592	.....	511	1.1	361	366
Sioux City & St. Paul	148	148	.....	.....	.....	25,988	24,863	1,125	.....	4.5	176	168
Toledo, Peoria & Warsaw	237	237	.....	.....	.....	143,471	113,013	30,458	.....	27.0	605	477
Totals	14,988	14,675	313	.....	.....	$8,516,520	$8,096,569	$632,485	$212,534	.....	$568	$552
Total increase or decrease	.....	.....	313	.....	2·1	.....	.....	419,951	.....	5.2	.....	.....

RAILROAD EARNINGS, EIGHT MONTHS ENDING AUG. 31.

Name of Road.	Mileage. 1876.	1875.	In.	Dec	Per c.	Earnings. 1876.	1875.	Increase.	Decrease	P.c.	Earnings per mile. 1876.	1875.	Inc.	Dec.	P.c.
Atchison, Topeka & Santa Fe	690	508	182	....	35.8	$1,476,205	$840,950	$635,255	.....	75.5	$2,139	$1,651	$484	.....	29.2
Cairo & St. Louis	146	135	11	....	8.1	172,745	166,803	5,942	.....	3.6	1,183	1,236	.....	$53	4.3
Canada Southern	452	452	....	....	.....	1,084,762	726,883	357,879	.....	49.2	2,400	1,608	792	.....	49.2
Central Pacific	1,315	1,294	17	....	1.3	11,257,166	10,999,422	257,744	.....	2.3	8,561	8,474	87	.....	1.0
Chicago & Alton	650	650	....	....	.....	3,149,645	2,912,371	237,272	.....	8.1	4,846	4,481	365	.....	8.1
Chicago, Milwaukee & St. Paul	1,400	1,399	1	....	.....	5,215,277	4,865,352	349,925	.....	7.2	3,725	3,478	247	.....	7.2
Cleveland, Mt Vernon & Del	157	157	....	....	.....	245,283	278,167	.....	$2,884	10.9	1,562	1,753	.....	191	10.9
Denver & Rio Grande	153	120	33	....	27.5	288,421	235,734	52,687	.....	22.4	1,885	1,964	.....	79	4.0
Illinois Central	1,109	1,109	....	....	.....	4,625,704	4,815,421	.....	189,717	3.9	4,171	4,342	.....	171	3.9
Indianapolis, Bloom. & West'n	344	344	....	....	.....	996,313	792,040	204,273	.....	25.8	2,896	2,305	591	.....	25.8
International & Gt. Northern	459	459	....	....	.....	724,278	741,528	.....	17,250	2.3	1,578	1,616	.....	38	2.3
Kansas Pacific	775	761	14	....	1.8	1,852,867	2,090,265	.....	237,398	11.4	2,391	2,747	.....	356	13.0
Louisville & Nashville	738	738	....	....	.....	3,169,278	2,901,514	267,764	.....	9.2	4,294	3,932	362	.....	9.2
Michigan Central	804	804	....	....	.....	4,438,883	4,196,197	242,686	.....	5.8	5,521	5,219	302	.....	5.8
Missouri, Kansas & Texas	786	786	....	....	.....	1,936,506	1,711,682	224,824	.....	13.1	2,464	2,178	286	.....	13.1
Nashville, Chattanooga & St. L.	341	341	....	....	.....	1,135,135	1,017,792	117,343	.....	11.5	3,329	2,985	344	.....	11.5
Ohio & Mississippi	615	560	55	....	9.8	2,388,313	2,085,991	302,322	.....	14.5	3,883	3,725	158	.....	4.2
Paducah & Memphis	115	115	....	....	.....	134,798	121,111	13,687	.....	11.3	1,172	1,053	119	.....	11.3
Philadelphia & Erie	288	288	....	....	.....	2,089,841	2,118,637	.....	28,796	1.4	7,256	7,356	.....	100	1.4
St. Louis, Alton & Terre Haute, Belleville Line	71	71	....	....	.....	298,723	354,283	.....	55,560	15.7	4,207	4,990	.....	783	15.7
St. Louis, Iron Mt. & Southern	685	685	....	....	.....	2,265,273	2,153,147	112,126	.....	5.2	3,307	3,143	164	.....	.....
St. Louis, Kansas City & North'n	504	504	....	....	.....	1,972,890	1,637,675	335,215	.....	20.5	3,914	3,249	665	.....	20.5
St. Louis & Southeastern	349	349	....	....	.....	701,924	620,023	81,901	.....	13.2	2,011	1,777	234	.....	13.2
St. Paul & Sioux City	122	122	....	....	.....	360,978	29?,073	62,?05	.....	21.1	2,959	2,442	517	.....	21.1
Sioux City & St. Paul	148	148	....	....	.....	218,333	157,817	60,516	.....	38.3	1,475	1,066	409	.....	38.3
Toledo, Peoria & Warsaw	237	237	....	....	.....	929,502	631,745	297,757	.....	47.1	3,922	2,665	1,257	.....	47.1
Totals	13,453	13,140	313	....	.....	53,129,041	49,467,623	4,220,023	$558,606	.....	$3,949	$3,778	$171	.....	4.5
Total increase	.....	.....	313	....	2.4	.....	.....	3,661,418	.....	7.4	.....	.....	.....	.....	.....

RAILROAD GAZETTE

Published Every Saturday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

CONTENTS:

	Page.
ILLUSTRATION:	
Rapid Transit Locomotive, Facing	425
CONTRIBUTIONS:	
The Justifiable Expenditure in Improvement of Alignment of Railways	421
Street Railroad Locomotives	423
Erecting Locomotive Guide Bars	423
EDITORIALS:	
The Cotton Traffic	424
The Course of Grain Exports	425
The Grain Movement for Twenty-one Weeks	425
Sales of the St. Louis, Rock Island & Chicago Railroad	425
Hell Gate Blown Open	426
EDITORIALS:	
The Stability of the New York Central	426
Record of New Railroad Construction	426
EDITORIALS NOTES	426
GENERAL RAILROAD NEWS:	
Railroad Earnings in August	423
Elections and Appointments	426
Personal	426
Traffic and Earnings	427
The Scrap Heap	427
Old and New Roads	427
Annual Report	430
MISCELLANEOUS:	
Master Mechanics' Association—Circular on Locomotive Tests	423
Specifications for Steel Rails	426

Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

THE COTTON TRAFFIC.

The last cotton-crop year closed with August, and in a late issue the *Commercial and Financial Chronicle* (an acknowledged authority on the cotton trade) publishes elaborate statistics of the production and movement of the year. Cotton forms but an inconsiderable proportion of the freights of the country. The whole crop of last year, which lacked but a few bales of being the heaviest ever known, weighed but about 1,100,000 tons—less than 40,000,000 bushels of corn, and less than a sixth of a full year's shipment of anthracite over a single railroad. Moreover, it is a crop distributed over a vast area of country. Yet there is probably no one crop in the country on which depends the welfare of so large a mileage of railroads. Through the largest part of the South, indeed, the prosperity of the railroads depends chiefly upon the prosperity of the cotton planters. It is not the transportation of the cotton alone, or even chiefly, that gives occupation to the railroads. In a country where it is almost the only staple marketed, the purchases of merchandise and the amount of traveling depend almost entirely on the returns from the cotton—on the profits of the crop, not on its bulk. The largest crop adds something to the freight carried out of the country, but if it is not marketed at remunerative prices there is no corresponding bulk of merchandise carried into it.

The last year's crop was an example: It has been exceeded but once, sixteen years ago, and then by but 482 bales; but prices were low, and in consequence the general business and the railroad earnings of the year in the South were poor.

One of the most interesting lessons to be learned from the *Chronicle's* statistics is drawn from the statement of crops for 46 years. Looking above and below the war years—1861–65, where "no record" is entered in place of the figures for the bales produced—we find that the business, by many thought to have been permanently crippled by the war and the results of the war, has been completely re-established. During the eleven years since the war, in spite of the demoralization of labor and loss of capital which greatly decreased production for at least the four years following the war, the total production has been just about the same as for the eleven years next before the war, as follows:

1850–51 to 1860–61	36,169,207 bales
1865–66 to 1875–76	36,331,582 bales

an averge of 3,288,110 bales per year for the earlier and of 3,302,870 for the later period. Of late years, however, the production has averaged larger than for any series of years before the war. The five years before the war were the culmination of a period of increasing production; but for those years the average crop was but 3,646,148 bales, while for the last five it has been 3,915,505 bales—larger by no less than 7⅛ per cent. Still it is not safe to conclude that production is increasing; it *has* increased, and since the subsidence of the greatest disturbing influences of the war has attained greater proportions than before the war; but as early as 1870–71 the crops was not much smaller than last year and larger than for any intervening year. It is probable, however, that there is some increase from year to year in the area and the force devoted to cotton culture.

Though, as we have seen, the total weight of the cotton crop is comparatively small, it still affords a disproportionately large amount of transportation. The wheat crop is six times as heavy, but usually nine-tenths of our wheat is consumed in this country and a very large proportion in the States where it is raised. The corn crop is many times still larger, but only an inconsiderable fraction of the corn is marketed at all. But nearly every bale of cotton is shipped by rail or steamboat, most of it is carried three thousand miles to the European factories, and the greater part of that manufactured in America is carried at least a thousand miles between the plantation and the mill. The rail transportation is for the most part not so great. Most of the cotton goes to the Gulf and South Atlantic seaports, and most of it is produced within 300 miles of the coast. The rail transportation has increased of late years, however, and shipments are made from the interior of Texas to St. Louis, which must finally go chiefly to the Eastern States, after a journey of nearly 2,000 miles by rail. So Memphis and Vicksburg, which can always ship very cheaply down the Mississippi to New Orleans, and formerly sent nearly all their purchases by that route or up the Mississippi and Ohio, now ship by rail largely to Norfolk and to a considerable extent direct to Eastern markets and mills. The railroads have gained largely from the rivers since the war, so much so that there has been an entire abandonment of the business of running cotton boats on many Southern rivers; but the long hauls across country have been gained mainly by great reductions of rates, and probably the railroads as a whole, though they have greatly increased their cotton traffic, do not get any more for the work than when their hauls were chiefly short, to near-by sea-board and river cities.

The chief indication of the distribution of the cotton movement is furnished by the receipts of the different ports, which indeed form the basis of the statistics. The *Chronicle* reports chiefly by States, but there is no State which has more than one important port, so that the figures indicate well enough the centres of the cotton traffic.

New Orleans continues, as it long has been, the great cotton port. Last year its receipts from the interior were 33¾ per cent. of the whole receipts from the crop, against 28½ per cent. the previous year.

The percentages of total receipts at the several leading ports were:

	1875–76.	1874–75.
New Orleans	33.8	28.4
Norfolk	12.7	12.0
Savannah	12.5	17.2
Galveston	11.7	10.5
Charleston	10.0	12.5
Mobile	9.0	9.1
New York	4.8	4.5

The receipts here counted are those from the interior, excluding what arrived from any other port, the receipt being credited to the port at which it first arrived.

The only great changes are the large gain at New Orleans and the large loss at Savannah and Charleston. Texas, which is by far the most rapidly growing of the cotton States, increased its receipts at its own ports about one-eighth more than the average, but a considerable part of the Texas production goes east or north by rail and never reaches the Texas ports, and these shipments (especially those to St. Louis) increase much faster than the receipts at Galveston and Indianola.

The proportion of the crop shipped direct to the mills is small but apparently increasing—7½ per cent. last year and 5½ per cent. the year before. Most of that part of the crop consumed in this country first goes to a seaport. Seventy per cent of the crop was exported both years, so that we have nearly one-fourth of the home consumption this year and one-sixth last shipped directly to the mills. However, a much larger amount is shipped to seaports near the mills, chiefly to New York and Boston. These Northern ports received 6¾ per cent. of the whole crop last year directly from inland points, and no less than 27 per cent. of it from seaports further south. These Northern ports exported about 13¾ per cent. of the crop. The shipments from Southern seaports to the Northern ones is not by sea entirely by any means. A large proportion, having been carried by rail from the interior to a Gulf or South Atlantic port, is forwarded thence by rail to a Northern port.

Memphis is the greatest of the interior cotton markets. Last year it shipped 484,545 bales, or 10¼ per cent. of the entire crop; but St. Louis, which but a few years ago was not counted among the cotton markets, doubtless stands next, with shipments of about half that amount (243,064 bales) last year. Other important inland markets are Atlanta, Macon, Montgomery, Nashville, Vicksburg, Shreveport and Houston. So considerable a portion of the receipts of Southern ports being reshipped to Northern ports, and of the receipts of Northern ports marketed for home consumption, the receipts of a port do not give a clue to its exports. Seventy per cent. of the whole crop, we have seen, is exported. New Orleans leads in exports, as it does in receipts from the interior, but New York stands second as an exporter, though its receipts from the interior are comparatively small. The proportion of total exports shipped from each leading port has been as follows for six years:

	Year ending Aug. 31.					
	1876.	1875.	1874.	1873.	1872.	1871.
New Orleans	42	37	40	44	45	41
New York	15¼	16⅝	17	21⅓	19	21½
Georgia	11⅓	15	15	14	15	14⅝
South Carolina	8⅝	10¼	8⅝	6	5¼	5½
Mobile	7¼	5	6¾	4	7	9
Texas	7¼	8⅓	9⅝	7¾	6	7
Norfolk	3½	2½	¾	½	1-5	1-6
Boston	1¾	1½	⅞	½	⅖	1-10
Philadelphia	1¼	1	1	¼	⅓	3-5
Baltimore	⅞	1⅝	1½	¾	¾	1½

No other port has exported as much as 1 per cent. of the crop of any of the six years.

For Georgia it would be proper to read Savannah for the last year, but in some of the previous years a very little has been exported from Brunswick; so Charleston is almost equivalent to South Carolina, less than a thousand bales having been exported from the other South Carolina ports. Of the Texas exports, all were from Galveston this year, but some may have been from Indianola previous years. This year its shipments were all to other United States ports.

New Orleans exported last year 85 per cent. of its receipts, Galveston about half of its receipts (nearly half of the rest being reshipped to New Orleans), and Mobile 65 per cent. of its receipts. So from all Gulf ports, receiving in all about 2,280,000 bales (nearly one-half of the crop), 1,843,000 bales were exported—more than four-fifths. Of the Atlantic ports of the South, Savannah exported 70 per cent. of its receipts; Charleston nearly 70 per cent.; Wilmington, 25 per cent.; Norfolk, 20 per cent. These ports, which received altogether 1,595,000 bales, exported 805,000 bales, or a little more than one-half. Thus the portion furnished for Northern consumption and Northern exports was:

From Gulf ports	437,000 bales.
From Atlantic ports south of the Chesapeake	790,000 "
From interior points to Northern ports	316,000 "
From interior points direct to Northern mills	333,000 "

These figures give some clue to the movement of the crop and its distribution among transportation routes. The Eastern manufactories, apparently, depend chiefly upon through rail shipments from the interior and the South Atlantic ports for their supplies; as is natural, these being the nearest supplies.

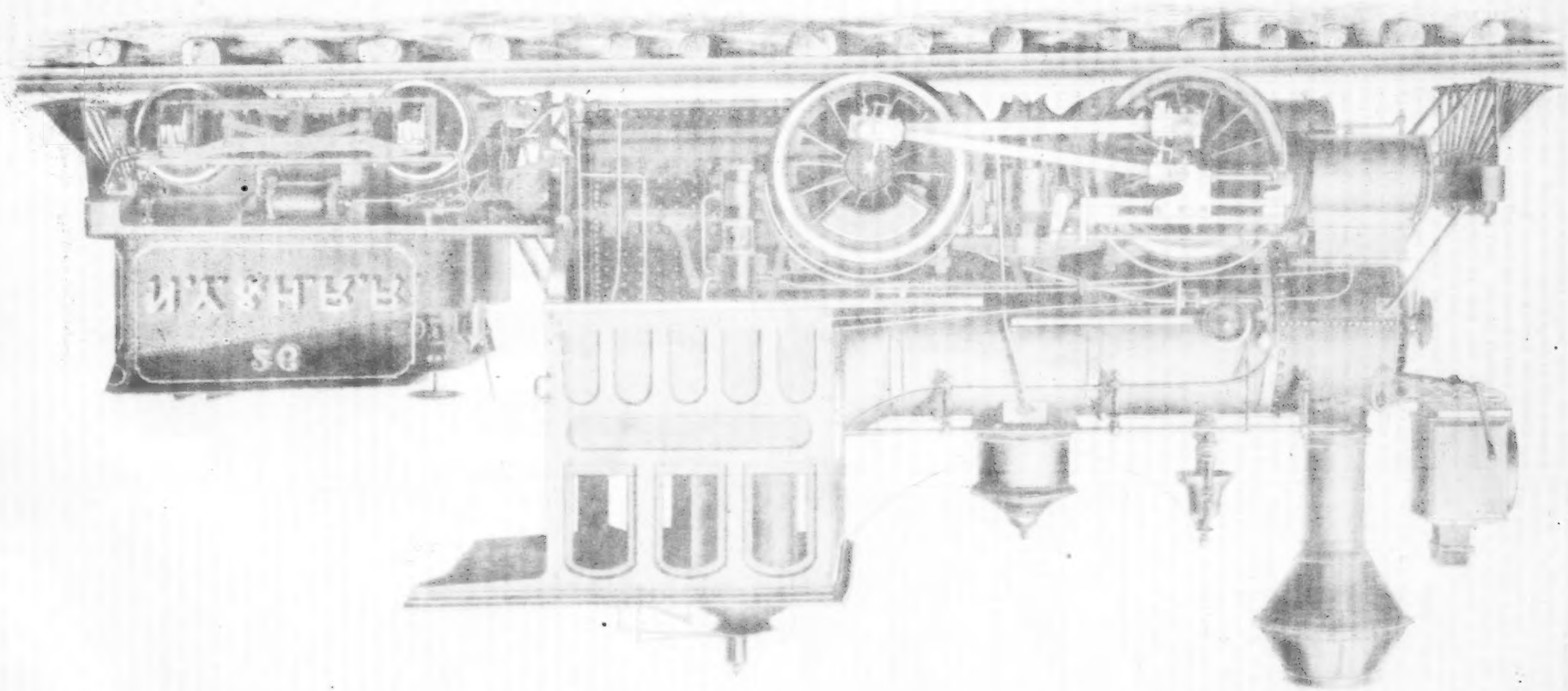
Observing the table above we see that for the last year the proportion of exports from New Orleans was just about the average of the five previous years. New York's rank is denoted by 15¼ the last year against an average of 19 for the five years previous; Savannah's by 11⅓ against 15; Charleston, 8⅝ against 7¼; Mobile 7¼ against 6.3; Galveston, 7¼ against 7¾, the first figure in all cases denoting the proportion of the total cotton exports shipped from the market named last year, and the second the proportion of total exports shipped from the same port during the previous five years.

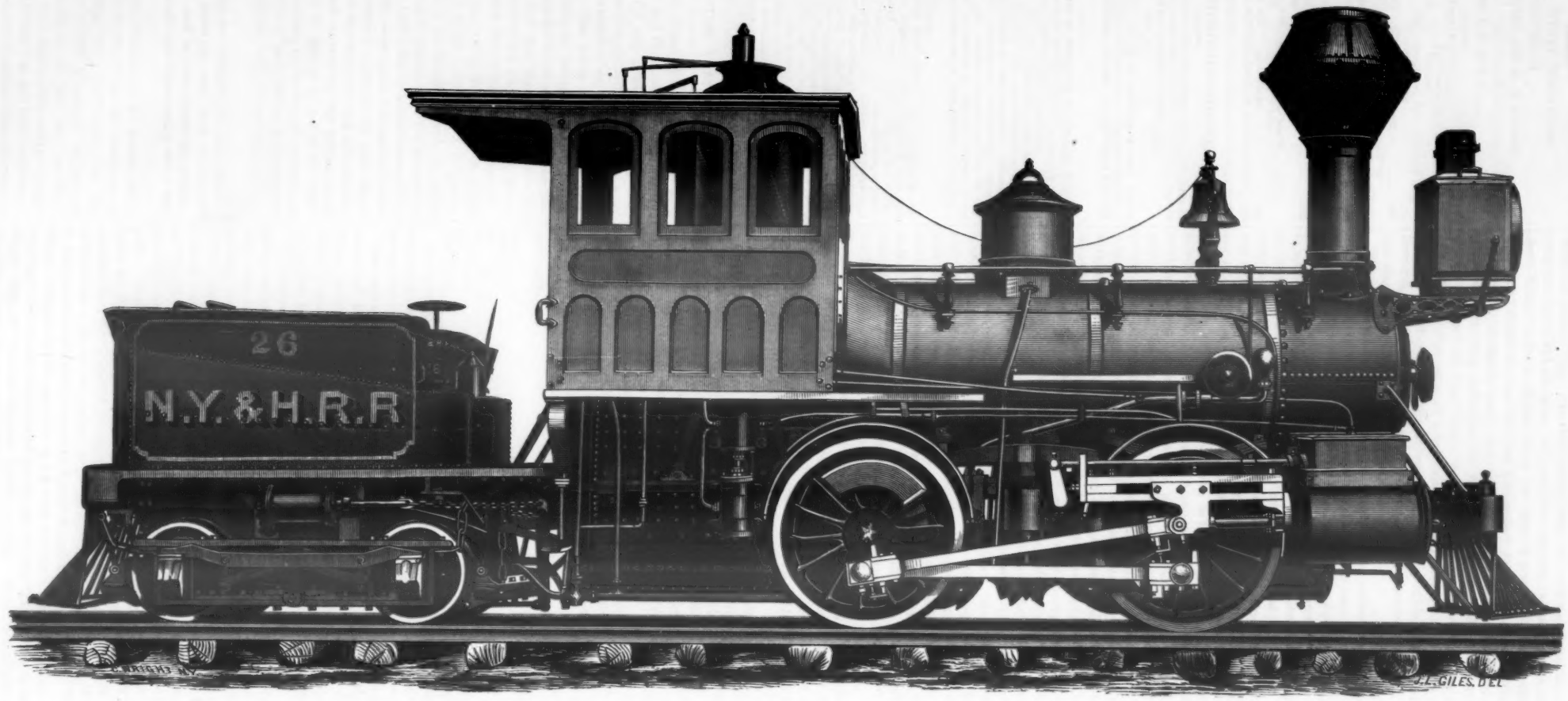
The chief object of comparing these proportions of exports is to ascertain whether there is any change in the export business. But the only changes which cannot be sufficiently accounted for by the fluctations in crops in different districts are a decrease in the proportion of New York exports, and an increase which nearly balanced it in the Norfolk exports. As between the South Atlantic and the Gulf ports, taken together, the differences are slight and there is no indication of a tendency in either direction, except that due to the creation, as it were, of the Norfolk export trade, which is at the expense of the Northern and not of the Southern or Gulf ports. As the new cotton country is chiefly in Texas, and almost wholly in the country tributary to New Orleans and further west, it was natural to expect that the Gulf exports would form a larger and larger proportion of the whole. But they have been quite stationary, as is shown below, where the figures for each crop year denote the percentage which the Gulf exports formed of the total exports:

	1876.	1875.	1874.	1873.	1872.	1871.
Gulf exports	56¾	50½	56	55¾	58	57

It will not do to infer from this that the distribution of *production* remains the same. Doubtless the proportion of the crop raised west of the Mississippi grows yearly larger; but meanwhile the efforts have increased to divert the cotton which formerly went to Gulf ports from them directly to the Eastern mills, to Northern ports, and to Savannah, Charleston and Norfolk. The Southern railroads east of the Mississippi have made special efforts to enlarge their traffic in this way, and the growing receipts at Nor-

"RAPID TRANSIT." LOCOMOTIVE FOR THE NEW YORK & HARLEM RAILROAD.





"RAPID-TRANSIT" LOCOMOTIVE FOR THE NEW YORK & HARLEM RAILROAD,

by the Schenectady Locomotive Works, Schenectady, N. Y.

folk and Wilmington, and probably the maintenance of the receipts at Savannah and Charleston, are chiefly due to this diversion of traffic which formerly sought the nearest seaboard market on the Gulf. The production of Texas must have increased greatly of late years, and much faster than that of the States further east; but still Galveston's exports have not increased more than those of ports further east, for a large part of the Texas crop, which formerly went almost wholly to Galveston, Indianola and New Orleans, now goes to St. Louis. This diversion of Western traffic to long rail routes seems to have just about balanced the increase in Western production, so that the changes in the proportions of business at different ports has been inconsiderable.

The Course of Grain Exports.

The grain exports have been diverted from New York this year to a greater extent even than the grain receipts, but the diversion has been chiefly in corn. The four seaports from Boston to Baltimore received from Jan. 1 to Sept. 16 this year 56,758,200 bushels of corn and exported 44,281,700 bushels. While New York is credited with 30.4 per cent. of the receipts, it made but 27 per cent. of the exports; Baltimore, with 31.4 per cent. of the receipts, afforded 36 per cent. of the exports, taking the lead as a corn exporter, though Philadelphia surpasses New York, with 30 per cent. of the exports though but 26.7 per cent. of the receipts. This shows that the competition of the Southern cities has been more effective than their receipts indicate. New York is the largest consumer of corn and doubtless distributes a considerable amount for local consumption. This traffic cannot be diverted. The only business on which the competition of Philadelphia and Baltimore could have much effect is the export business, and as we have seen, both Philadelphia and Baltimore have already surpassed New York in corn exports, though neither place had any considerable export business in any grain only a few years ago.

On the other hand, New York's position as an exporter of wheat is higher than its rank as a wheat receiver. The four ports named have received this year 24,142,000 bushels and have exported 22,765,000. While New York has but 75.8 per cent. of the receipts it has made 86 per cent. of the exports—has, indeed, exported considerably more than it received in that time. Philadelphia with 14.1 per cent. of the receipts shipped but 9.4 per cent. of the exports. Baltimore with 9.2 per cent of the receipts made but 4.2 per cent. of the exports. So far as the year's returns indicate, the only losses at New York have been in corn. As we have noted recently, however, of late weeks while New York has been leading in corn receipts its rivals have taken an unusually large proportion of the other grains. The Southern ports certainly have greater advantages for securing a large share of the corn than of the wheat crop—chiefly because the greater part of the wheat must pass through or close by lake ports on its way to market, and so is more likely to take the water route; but the remainder of this season's business will perhaps test the question whether Philadelphia and Baltimore can make considerable inroads into the New York wheat trade. This can be tested better after navigation closes, provided the rail rates remain as they are.

Indeed, excessively low rates make it for the interest of the Pennsylvania Railroad to discourage shipments to New York. With a 20-cent rate to New York, the usual difference of 10 per cent. in favor of Philadelphia leaves but two cents per hundred or 40 cents per ton, or 0.45 per ton per mile, for the haul from Philadelphia to New York. This is as much as on the rest of the line, but the terminal expenses at New York are probably several times as great as those at Philadelphia—so great that the regular terminal charge is five cents per hundred. Now even if the existing rate is sufficient to pay the cost of transportation between Philadelphia and New York, it still remains to the advantage of the Pennsylvania Railroad to deliver everything at Philadelphia in order to save the excess of the New York over the Philadelphia terminal expenses. It might be different were the rates higher and the difference between New York and Philadelphia rates consequently greater. With a rate of 40 cents to Philadelphia and 45 cents to New York, the profit on the price for carrying between the two cities might be sufficient to overbalance the difference in cost of handling, and then it would become the interest of the Pennsylvania Railroad to carry grain to New York.

This leads us to observe that if equal rates to all the seaports ever should be established, it would evidently become the interest of the Pennsylvania Railroad Company to deliver everything in Philadelphia forever thereafter. It certainly would not carry an additional 90 miles for nothing if it could avoid it. Indeed, it would doubtless make a higher rate to New York than that of competing roads, unless it should thereby diminish its aggregate trade. It would be its only rational policy to encourage Philadelphia and Baltimore business as against New York business.

As the Pennsylvania Railroad exercises a powerful influence over commerce throughout a large portion of the country and in all great traffic centres, it is worthy of consideration whether New York would not suffer more from the diversion of business which this company might effect than by a rate somewhat higher than the Philadelphia rate. Perhaps we should speak of the diversion which it *has* effected; for, as we showed two months ago, the Pennsylvania Railroad has ceased to carry large quantities of grain to New York. During the first half of 1874 the New York receipts by that road were 5,000,000 bushels; during the first half of this year, 1,700,000 bushels. That the railroad company has caused this diversion by its own action, we would not say; but it is evident that it has been for its interest to do what it could for this purpose whenever the difference between the New York and the Philadelphia rate has been so small (as it is now) that the profit was greater (or the loss less) on the Philadelphia business. Of course it will be still more for its interest to do this when there is no difference between New York and Philadelphia rates, unless it can in some way contrive to carry freight 90 miles for less than nothing. This is a matter which deserves the attention of the New York merchants who are anxious for equal rates from the West to Baltimore, Philadelphia and New York (but not to Boston).

If, however, with equal rates to all seaports, Baltimore and Philadelphia are unable to attract any considerable quantity of grain, the Pennsylvania will doubtless continue to carry to New York, and will carry more to that place than ever before. Its interest will not be to destroy the New York grain trade unless it can turn it to Philadelphia or Baltimore. If the grain cannot be so diverted, the Pennsylvania will doubtless carry all that it can get to New York: that is, it will accept the longer haul to New York with a small profit if it cannot succeed in getting the shorter haul to Philadelphia with a larger profit. It is the one railroad which can carry almost equally well to either New York, Philadelphia, or Baltimore, having the shortest line from Chicago to all three of these ports. If the rates to each port are in proportion to the cost of transportation to each over its lines, it is nearly indifferent between them, though it will make a little more profit on the shipment to the more distant port; but if the rates are alike to all, it is much to its advantage to carry exclusively to the nearest port, or wherever it incurs the least expense.

The Grain Movement for Twenty-one Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

Week ending—	By lake.	By rail.	Total.	Per ct. by rail.
April 29	1,634,541	2,072,946	3,707,487	56
May 8	2,445,191	2,292,633	4,737,824	48½
" 13	1,538,526	2,302,940	3,841,466	60
" 20	1,602,170	2,016,304	3,618,474	55¾
" 27	1,747,408	1,820,456	3,567,864	51
June 3	2,412,162	1,797,922	4,210,084	42¾
" 10	2,894,915	2,147,670	5,042,585	42½
" 17	2,921,405	2,391,811	5,313,216	45
" 24	2,728,706	2,198,054	4,926,760	44½
July 1	1,821,155	1,784,548	3,605,703	49½
" 8	1,765,010	1,205,184	2,970,194	40½
" 15	1,648,508	1,228,678	2,877,186	42¾
" 22	2,269,336	1,032,825	3,302,161	31½
" 29	1,466,502	1,038,208	2,504,710	41½
Aug. 5	2,055,243	1,283,268	3,338,511	38½
" 12	1,744,059	1,300,720	3,044,779	42¾
" 19	2,150,292	1,614,256	3,764,548	42¾
" 26	2,352,152	1,520,811	3,872,963	39¼
Sept. 2	1,698,491	1,573,058	3,271,549	48½
" 9	2,374,473	1,818,411	4,192,884	43½
" 16	2,963,634	1,688,318	4,651,952	36½
Total for 21 weeks	44,233,879	36,129,021	80,362,900	45

The shipments continue to increase, and for the last week are exceeded but four weeks in the twenty-one. All the increase over the previous week went to the lake vessels, which had the heaviest business of the season that week. Wheat at last has become a very important part of the traffic, about one-third of the entire shipments for the last week. Large shipments are to be expected at this season, but the figures have never been exceeded during a corresponding week of September, except in 1873 (when the fall movement was much the heaviest ever known), when it was 5,262,374 bushels against 4,651,952 this year.

For the same 21 weeks the receipts at the different Atlantic ports have been:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	13,470,134	31.2	35,461,861	43.9
Boston	4,707,087	10.9	6,254,494	7.7
Portland	410,600	0.9	758,470	0.9
Montreal	2,393,205	5.6	8,868,432	11.0
Philadelphia	10,716,650	24.8	15,169,700	18.8
Baltimore	9,844,500	22.8	12,022,985	14.9
New Orleans	1,617,190	3.8	2,227,758	2.8
Total.	43,159,366	100.0	80,763,710	100.0

Again New York, in comparison with its position the previous week, has gained in its proportion of corn receipts while losing (though but slightly) in general rank as a grain receiver. About 60 per cent. of the total receipts at the seaboard were of corn, which recently was the only grain which seemed to be leaving New York. As it gains back its corn trade, it seems hitherto to have lost its trade in other grains, and it is noticeable that during the last week reported it received but little more than one-fourth of the wheat. The latter grain is now beginning to come forward freely, and it will be interesting to see to what ports it will go.

During the last week the percentage of the total receipts of corn at each principal port was: New York, 47⅘; Baltimore, 20; Boston, 11¼; Philadelphia, 10⅕; Montreal, 10. In grains of all kinds these percentages were: New York, 42⅘; Montreal, 17; Baltimore, 16⅔; Philadelphia, 14; Boston, 9 per cent.

The crowding of the trunk lines with passenger trains, and in some cases the withdrawal of locomotives from freight service to move the extraordinary passenger trains, may have some effect on the freight movement by rail, and tend to drive the grain to the canal, and consequently to New York. Complaints have been made at Philadelphia of the difficulty of getting grain forward, and if the reported condition of things continues, we may expect a much larger proportion of receipts at New York than hitherto, and a decreased rail movement—the latter altogether to be rejoiced over as arising from the pressure of a more profitable traffic.

Rapid Transit Locomotive.

We give this week a full-page plate representing one of the three new tank engines built for the New York & Harlem Railroad, by the Schenectady Locomotive Works. They are intended to run local trains between New York and Williams Bridge, a distance of eleven miles. These trains are at time very heavy, owing to excursions, races, etc., and as the stopping places are very close together, very powerful engines are required for the service.

Their general plan will be recognized as that which has long been advocated by Mr. M. N. Forney. The frames which extend back of the fire-box are continuous, although they do not appear so on the engraving. The Westinghouse brake has been applied to the truck and also to the driving wheels. Owing to the great weight on the latter and the power which the brake exerts on them and also on the truck, the engine can be stopped very quickly, and as there is plenty of adhesion, it can be started without much danger of slipping. The following are their principal dimensions:

Gauge of Road	4 ft. 8½ in.
Total Wheel Base	20 ft. 11 in.
Distance between centres of Front and Back Driving-Wheels	6 ft. 8 in.
Total Weight of Locomotive in working order	72,000 lbs.
Total Weight on Driving-Wheels	49,500 lbs.
Diameter of Driving Wheels	48 in.
Diameter of Truck-Wheels	26 in.
Diameter of Cylinders	15 in.
Stroke of Cylinders	20 in.
Outside Diameter of smallest Boiler Ring	44½ in.
Size of Grate	35×53 in.
Number of Tubes	144
Diameter of Tubes	2 in. O. D.
Length of Tubes	9 ft. 6½ in.
Square Feet of Grate Surface	12.88 190
Square Feet of Heating surface in Fire-Box	81
Square Feet of Heating surface in Tubes	710.4
Total Feet of Heating surface	804.28
Exhaust Nozzles—single or double	Double
Diameter of Nozzle	2½ in.
Size of Steam Ports	1 ft. 13 in.
Size of Exhaust Ports	2¼ ft. 13in.
Throw of Eccentrics	4½ in.
Otside Lap of Valve	¾ in.
Inside Lap of Valve	1-16 in.
Size of Main Driving-axle Journal	6½+8 in.
Size of other Driving-axle Journal	6½+8 in.
Size of Truck-axle Journal	3¾×6 in.
Diameter of Pump Plunger	4¼ in.
Stroke of Pump Plunger	3½ in.
Capacity of Tank	1,200 gals.

Sale of the St. Louis, Rock Island & Chicago Railroad.

The Chicago papers contain reports, not very definite to be sure, that the St. Louis, Rock Island & Chicago Railroad (late the Rockford, Rock Island & St. Louis) has been sold to a leading Chicago railroad company, the reports varying as to the purchaser, all three of the Omaha pooled lines being mentioned—the Chicago & Northwestern, the Chicago, Rock Island & Pacific, and the Chicago, Burlington & Quincy—another report being that the purchase is for the joint account of the three companies. We are able to announce by authority that the negotiations were with the Chicago, Burlington & Quincy Company; that a price has been agreed upon by the representatives of the two companies, and that if nothing interferes the road will come into the possession of the purchasing company early in October, and that the Chicago, Burlington & Quincy is the sole purchaser.

This railroad is by itself one of the poorest properties of the kind ever constructed in a wealthy and populous state. But it has powers for injuring its rivals greatly exceeding its capacity for profiting its proprietors. From the Northwestern on the north it extends across the Rock Island and no less than five different lines of the Burlington road to St. Louis. Isolated as it has been from Chicago, it could not make an inroad on the local traffic of one of these roads without the co-operation of one of the others. This co-operation it has failed to get. The three companies have an agreement for the division of one important traffic, and the lessons of recent years have lessened any inclination they may have felt to invade each others' territory for the purpose of dividing a traffic, and thus court a counter invasion. But the Rockford road (as it is generally called) would be able to make a connection with Chicago through the new Chicago & Pacific (very recently become bankrupt) by constructing about 40 miles of new road. It had done something towards securing the construction of this connecting link, with which it would become capable of considerable mischief to several roads in Illinois besides the three in the Omaha pool. For it would form a long line between St. Louis and Chicago, with something of the power over the traffic of the short lines by the Chicago & Alton and Illinois Central that the Grand Trunk route between Boston and Chicago has over the traffic of the short lines by way of Albany. That is, it would have a line so circuitous that it could hardly get traffic for it without underbidding the rates by the short route—with all the mischief that the fact implies. Somewhat similar would be its position with respect to the Chicago, Burlington & Quincy's five crossings, and the Rock Island and Davenport business of the Rock Island road, though both routes would be of about the same length from these places. The damage almost sure to result would be without any equivalent benefit to the owners of the new line, it is true; but it is a sufficient reason to justify the old companies, or either of them, in taking measures to avoid it.

But the acquisition of this road by one of the Omaha railroad lines will have another effect: it will give it (or all of them, if they agree) a line between Omaha and St. Louis, which by the Burlington road would be but little longer than the shortest, and so will give the owner a voice in the adjustment of St. Louis-Omaha business, which is now the chief occasion of disturbances in Omaha rates. Putting together the Burlington and the Rockford roads, a route 505 miles long is made between St. Louis and Omaha, against 477 by the St. Louis, Kansas City & Northern, and another route 346 miles long between Chicago and St. Louis, against 280 miles by the Chicago & Alton—both therefore practicable routes for competing for through traffic.

Mr. Osterberg bid in the Rockford railroad at the foreclosure sale for $1,320,000, and at that time and thereafter he represented that some of the Chicago companies had made overtures to purchase it. Doubtless the road can be more useful to one of these companies than to any one else, and one of them could afford to pay for it more than it is worth to the owners if they work it themselves. At the foreclosure sale it brought less than $5,000 per mile; and it need not be very profitable to make a fair return on a higher price, though the control of it is desirable more for the sake of preventing losses than for making profits. It can be worked better in connection with the Chicago, Burlington & Quincy than with either of the lines north of it, however, though there is one part of it which would join very neatly with the Northwestern, and another which the Rock Island could work conveniently.

The first line of the Chicago, Burlington & Quincy crossed by this road is that from Mendota to Clinton (now having a very light traffic). This crosses the Rockford road 35 miles northeast of Rock Island and 16 miles southwest of the Northwestern at Sterling. By this line the Burlington road would have a line from Chicago to Rock Island only 167 miles long, against 182 miles by the Chicago, Rock Island & Pacific road. That the company will run trains to compete for Rock Island business, however, does not follow. The distance by the Northwestern and the Rockford road is but 160 miles, and the latter would doubtless always have been glad to make an alliance for this business; but the Northwestern has not cultivated this traffic, probably because it had as much to fear from competition with the Rock Island road elsewhere as to hope from any Rock Island and Davenport local traffic, which is all it could hope to get. A route of almost the same length can be made by connecting the Chicago & Rock River Branch of the Burlington road at Rock Falls with the northeastern terminus of the Rockford road at Sterling, to do which little more is needed than to bridge Rock River. But to make this line it would be necessary to use about 30 miles of the Chicago & Iowa Railroad, in which the Burlington Company has an interest, though it does not own or work it. All the part of the road from Sterling down to the crossing of the Quincy road at Bushnell, 125 miles, could be worked very well in connection with either of the above described routes to Chicago; and all that part south of it in connection with the Chicago-Quincy line, on which Bushnell is situated. Then the northern part of the line, being north and west of the present Chicago-Quincy line, extending from Aurora or Mendota in an arc around to Bushnell, would form a loop with the last-named line.

If this sale is consummated, as probably it will be, it will deserve attention as an example of the natural and most desirable disposition of a very large class of bankrupt roads, whose construction was never justifiable perhaps, but which, now that they are constructed, will be most useful if absorbed into or divided among the systems of solvent roads in the same territory. We may naturally look and rationally wish for many more such transfers.

The Stability of the New York Central.

New York Central & Hudson River stock has recently suffered an assault from the bears, the price being forced down from 102 to 96. It is not so strange that this was done as that it was not done before, considering the long period of extremely depressed rates on through traffic, and the very large proportion of through traffic on this road. But the fall at this time was aided at least by certain "analyses" of the accounts of this company, such as frequently appear in the financial columns of New York daily papers (at a dollar a line), when speculators have an interest in moving prices up or down. One of these articles intimated that this company's dividends, or a large part of them, for a series of years, have been paid from the proceeds of sales of bonds or charged to construction—that virtually they were paid out of capital, and that there has been a loss on the Harlem lease. Departing from the usual policy of this company, Mr. Wm. H. Vanderbilt, the Vice-President, addressed a letter to the city papers last Saturday (copied elsewhere) in which he affirms positively that the company "has paid all its dividends and interest from net earnings, and from no other source, whatever." A more important statement than this, however, is made in Mr. Vanderbilt's letter, namely, that during the past year "the company has met all its engagements and earned and paid its usual quarterly dividends, and its business gives every assurance that it will be able to continue to do so." This year, it must be remembered, was divided almost equally into a season of comparatively high rates with fair business, and another (the present) of extremely low rates and, most of the time, pretty heavy business. If this year has been a prosperous one (and 8 per cent. dividends are almost superlative prosperity in these times), it is not easy to see how the company can be brought to grief unless by a continuation of the present rates all the year round instead of half of it. But another thing follows: if the company can make such profits with such rates, it need never make higher ones—higher, that is, than the *average* of the past year, or but a trifle higher. If so, and the contest for through business comes to an end, we might hope to see somewhat lower winter through rates, considerably higher summer through rates, and some reduction in local rates—that is, if a permanent peace could be depended upon.

As things go, however, the railroads have to take what they can get and take it when they can get it. "A fair, average rate" maintained during peace would lead to ruin during the next railroad war, which is always an event so probable that it must be provided for.

Hell Gate Blown Open.

The blowing up of Hallet's Point Reef, which formed a part of the obstruction known as Hell Gate, in East River between New York and Long Island, at the entrance of Long Island Sound, has been a subject of very general interest and much speculation in that locality for some time before the explosion took place. The channel in the East River at Hallet's Point has a sort of zig-zag course, and the reef projected from the Long Island shore into one of the angles made by the course of the stream, and with the strong currents which prevail at certain stages of the tide it has been the cause of much danger and many accidents to shipping. Its removal was, therefore, a matter of much importance to the commerce of New York, and for a half-dozen years or more Congress has been making appropriations for its removal. For the past few years the work has been in charge of Gen. John Newton, of the Corps of Engineers.

The form of the reef was nearly semi-circular, or, more accurately, semi-elliptical, the major axis which formed the shore line being 720 feet long, and one-half of the minor axis, which was the distance the reef extended out from the shore, was 300 feet. The plan adopted to remove it was to sink a coffer-dam about the centre of the semi-circle, and then drive tunnels radially from this centre into the rock. Circumferential tunnels were then carried through the divisions which separated the radial tunnels, which left a series of pillars which supported the roof which was left. The general plan was very much that of a field-spider's web.

After this was done, all the rock which remained was charged with comparatively small charges of explosives scattered all through the structure. These were connected with electric wires, and the whole exploded last Sunday afternoon by electricity. Fears were entertained that much damage would be done to property in the vicinity, but a more mild or well-behaved explosion it would be hard to imagine, that is, if it was intended to do any considerable amount of work. A slight tremor to the surrounding ground and a low, dull report, and a column, or rather a cluster of columns, of water thrown up some thirty or forty feet was all that made itself apparent.

The amount of explosives used was as follows:

Dynamite	28,901 lbs.
Rend Rock	9,061½ "
Vulcan Powder	14,244 "
Total	52,206½ lbs.

The cubical contents of the reef were 51,000 yards and the total expenditure thus far has been $1,940,000.

The explosion is said to have been very effectual, but its whole benefit will not be gained until the loose rock which remains is removed.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Green Bay & Minnesota.—The *La Crosse Extension* is completed from Onalaska, Wis., southward to La Crosse, 6¾ miles.

Rock Island & Mercer County.—The first track is laid, from Milan, Ill., south 6 miles.

Chicago, Rock Island & Pacific.—The *Oskaloosa Branch* is extended from Oskaloosa, Ia., west to Olive Branch, 10 miles.

Natchez, Jackson & Columbus.—Extended east 2 miles to Fayette, Miss. It is of 3 ft. 6 in. gauge.

Texas & New Orleans.—The track from Beaumont, Tex., westward is extended 10 miles to East Liberty. The track from Orange west is extended 8 miles.

This is a total of 42¾ miles of new railroad, making 1,599 miles completed in the United States in 1876, against 761 miles reported for the corresponding period in 1875; 1,082 in 1874, 2,691 in 1873 and 4,765 in 1872.

AUGUST EARNINGS are reported in our table from 29 railroads with 14,988 miles of road, or about one-fifth of the total in the country. Ten of the number had smaller earnings this than last year. In the aggregate there was an income of 5.2 per cent. in earnings with an increase of but 2.1 per cent. in mileage. The earnings per mile increased from $552 to $568, which is at the rate of about 3 per cent.

For the eight months ending with August we have reports from 26 roads, with 13,453 miles of line. Only six show a decrease for this period, and there is an increase of 7.4 per cent. in their aggregate earnings, while the increase of mileage was but 2.4 per cent. The average earnings per mile were $3,949 this year against $3,778 last, showing an increase of 4⅓ per cent—a very good showing on the whole.

Specifications for Steel Rails.

The following has been published by the Pennsylvania Railroad Company:

As it is the desire of the Pennsylvania Railroad Company to have on the roads under their control none but first-class tracks in every respect, and as the rails laid down on these tracks form an important part in the achievement of this result, the Pennsylvania Railroad Company have found it necessary to make certain demands in regard to the manufacture of their steel rails, with which the different rolling-mills and rail-inspectors will be required to comply.

1. That the steel used for rails shall be made in accordance with the "pneumatic" process, and contain not less than thirty one-hundredths nor more than fifty one-hundredths of one per cent. of carbon.

2. That a test bar one foot long and three-quarters of an inch square is to be taken from the head of a rail made from each charge. This bar is to be supported at each end, leaving a space of eight inches between bearings, and, by a sudden pressure on the centre of the bar, deflected to an angle of eighty degrees from a straight line. This angle will be made the limit between good and bad tests. If the bar bends eighty degrees without breaking, the charge will be considered good; if the bar breaks before bending, or shows signs of fracture at this angle, two more bars are to be tested; if both these bars stand the test, the charge will be considered first-class steel; but if one of them breaks, the charge will be rejected and called *second-class steel*.

3. The result of the test of each charge of which the Pennsylvania Railroad Company are to receive rails, and of which an official record is kept at each mill, is to be exhibited to the rail-inspector.

4. That the number of the charge and place and year of manufacture shall be marked in plain figures and letters on *the side* of the web of each rail.

5. That the section of the rails rolled shall correspond with the respective templates issued by the Pennsylvania Railroad Company showing the shape and dimensions of the different rails adopted as their standard.

6. That the space between the web of the rails and *template* representing the splice-bar, shall not be less than one-quarter of an inch, nor more than three-eighths of an inch.

7. That the weight of rails shall be kept as near to standard weights as can be demanded after complying with Section No. 5.

8. That circular holes one inch in diameter shall be drilled through the web in the centre thereof, at equal distances from the upper surface of the flange and lower surface of the head, and three and fifteen-sixteenths inches from the end of the rail to the centre of the first hole, and of five inches from the centre of the first hole to the centre of the second hole.

9. That the lengths of rails at sixty degrees Fahrenheit shall be kept within *one-quarter of an inch* of the standard lengths, which are 30 feet, 27½ feet, and 25 feet. That not more than 10 per cent. of rails of the shorter lengths shall be delivered on any one contract.

10. That the rough edges produced at the ends of rails by the saw shall be well trimmed off and filed.

11. That rails are so straightened that they will insure a perfectly straight track.

12. In order to get the exact length as mentioned in paragraph No. 9, it is necessary that the rails should be cut off at as near a uniform temperature as practicable, that the blooms should not be detained in the process of rolling, and should go to the saws at a uniform temperature.

The causes for a *temporary* rejection of the rails are—

1. Bad straightening.
2. Imperfect ends (which, after being cut off, would give a perfect rail of one of the standard short lengths).
3. Missing test reports.
4. A variation of more than one-quarter of an inch from the standard lengths.

The causes for a *permanent* rejection of a rail are—

1. A bad test report, showing a deficiency or excess of carbon.
2. The presence of a flaw of one-quarter of an inch in depth in any part of the rail.
3. The presence of such other imperfections as may involve a possibility of the rail breaking in the track.
4. A greater variation between the rail and splice-bar than is allowed in paragraph No. 6.

By order of the General Manager.

WM. H. BROWN, Engineer Maintenance of Way.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

European & North American.—The Maine Supreme Court has appointed N. C. Ayer, W. B. Hayford and Noah Woods Receivers of the road in Maine, on petition of the second-mortgage bondholders.

New York, New Haven & Hartford.—Mr. W. A. Burroughs, of Bridgeport, Conn., has been chosen Treasurer, in place of John F. Shelton, deceased.

Canada Central.—At the adjourned annual meeting in Ottawa, Canada, Sept. 15, the following directors were chosen: John Ashworth, E. McGillivray, D. McIntyre, Wm. Moffat, H. V. Noel, James O'Halloran, N. Peters, H. L. Redhead, J. Skead, John Smith.

Master Car Painters' Association.—At the annual convention in Philadelphia, Sept. 20, the following officers were chosen: President, M. W. Shires, Boston & Albany, Springfield, Mass.; Vice-President, R. T. Bazley, Maine Central, Waterville, Me.; Secretary and Treasurer, R. McKeon, Atlantic & Great Western, Kent, O.

Pacific, of Missouri.—Mr. George H. Heafford has been appointed Acting General Passenger Agent, in place of E. A. Ford, resigned. Mr. Heafford served his apprenticeship in the Auditor's office on the Chicago & Northwestern, but has been in St. Louis several years.

Santa Cruz & Felton.—At the annual meeting in Santa Cruz, Cal., recently, the following directors were chosen: C. W. Gorrie, J. S. Carter, W. D. Tisdale, C. G. Harrison, J. D. Pearce, Charles Silent. The board elected C. W. Gorrill, President; W. D. Tisdale, Treasurer; Alexander Mackie, Secretary.

Keokuk & Des Moines.—Mr. Frank K. Hain has been appointed General Superintendent, in place of Mr. George H. Griggs, who has gone to the Connecticut Valley road. Mr. Hain was for some time and until recently Superintendent of Motive Power of the Erie Railway, and was formerly connected with the Baldwin Locomotive Works. His office is at Keokuk, Ia.

Bangor & Calais Shore Line.—At a recent meeting of the directors in Machias, Me., Mr. Ignatius Sargeant was chosen Treasurer and L. L. Buckland Chief Engineer.

Hoosac Tunnel Line.—Mr. B. McChan has been appointed General Western Passenger Agent, with office in Chicago.

American Society of Civil Engineers.—The last number of the *Journal* of this Society announces the following additions to the list of members: Henry Coppee (Junior), Assistant Engineer Pennsylvania Railroad, Philadelphia; Joseph P. Cotton, Assistant United States Civil Engineer, Newport, R. I.; Charles L. Crandall (Junior), Assistant Professor Engineering Department, Cornell University, Ithaca, N. Y.; J. Howard Johnson, Resident Engineer, Juliaco & Cuzco Railroad, Mollendo, Peru; C. Vanderwort Smith, Chief Engineer Manhattan Gas Light Company, New York.

PERSONAL.

—Mr. J. D. Criley, of Topeka, Kan., a well-known railroad contractor, died of typhoid fever in Columbus, O., Sept. 17. He had just completed a contract for laying the track of the Scioto Valley road, between Columbus and Chillicothe, and was making preparations to return home.

—Mr. E. A. Ford has resigned his position as General Passenger Agent of the Missouri Pacific to accept a similar position on the St. Louis, Iron Mountain & Southern road.

—Gen. J. S. Casement, the well-known railroad contractor famous for his work on the Union Pacific, the Canada Southern and many other roads, is running for Congress in Ohio as an independent candidate.

—Mr. George H. Vroom, for 18 years past General Supervisor

of Bridges of the Baltimore & Ohio Railroad, died at his residence in Zanesville, O., Sept. 19.

—Hon. John Reilly, formerly Master of Transportation of the Pennsylvania Railroad, has been renominated for Congress by the Democrats of the Seventeenth Pennsylvania District.

—Major S. F. Van Forstner, late Engineer of the New York & Oswego Midland Railroad, has been elected City Engineer of Scranton, Pa.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending June 30:	1875-76.	1874-75.	Inc. or Dec.	P. c.
Toledo, Wabash & Western	$4,234,214	.....	.....	....
Expenses	3,519,764	.....	.....	....
Net earnings	$714,450	.....	.....	....
Earnings per mile.	6,737	.....	.....	....
Per cent. of expe..	83.13	.....	.....	....
Toronto, Grey & Bruce	372,336	$331,528	Inc .. $40,808	12.3
Expenses	233,428	258,104	Dec.. 24,676	9.6
Net earnings	$138,908	$73,424	Inc .. $65,484	89.2
Earnings per mile.	2,002	1,782	Inc .. 220	12.3
Per cent. of expe..	62.90	77.86	Dec.. 14.96	19.1
Eight months ending Aug. 31:	1876.	1875.		
Kansas Pacific	$1,852,867	$2,090,265	Dec.. $237,398	11.4
Expenses	1,148,381	.....	.....	....
Net earnings	$704,486	.....	.....	....
Per cent. of expe..	61.98	.....	.....	....
Missouri, Kansas & Texas	1,936,506	$1,711,682	Inc .. $224,824	13.1
Expenses	1,204,635	.....	.....	....
Net earnings	$731,871	.....	.....	....
Per cent. of expe..	62.21	.....	.....	....
New Jersey Midland	412,975	.....	.....	....
Philadelphia & Erie.	2,089,841	$2,118,637	Dec.. $28,796	1.4
Expenses	1,522,622	1,491,418	Inc .. 31,204	2.1
Net earnings	$567,219	$627,219	Dec.. $60,000	9.6
Per cent. of expe..	72.86	70.40	Inc .. 2.46	3.5
St. Paul & Sioux City	360,978	298,073	Inc .. 62,905	21.1
Expenses	240,415	.....	.....	....
Net earnings	$120,563	.....	.....	....
Per cent. of expe..	66.60	.....	.....	....
Sioux City & St. Paul	218,333	$157,817	Inc .. $60,516	38.3
Expenses	167,482	146,670	Inc .. 20,812	14.2
Net earnings	$50,851	$11,147	Inc .. $39,704	356.1
Per cent. of expe..	76.70	92.90	Dec.. 16.20	17.4
Seven months ending July 31:				
New York & Oswego Midland	$276,431	.....	.....	....
Expenses	253,959	.....	.....	....
Net earnings	$22,472	.....	.....	....
Per cent. of expe..	91.88	.....	.....	....
Month of July:				
Louisville & Nashville	$369,499	.....	.....	....
Expenses	255,057	.....	.....	....
Net earnings	$114,442	$77,827	Inc .. $36,615	47.1
Per cent. of expe..	69.03	.....	.....	....
Wellington, Grey & Bruce	34,435	28,060	Inc .. 6,375	22.7
Month of August:				
Nashville, Chatta. & St. Louis	$131,103	$137,930	Dec.. $6,827	5.0
Expenses	84,637	78,785	Inc .. 5,852	7.4
Net earnings	$46,466	$59,145	Dec.. $12,679	21.4
Per cent. of expe..	64.57	57.13	Inc .. 7.44	13.0
New Jersey Midland.	62,325	46,444	Inc .. 15,881	34.2
Philadelphia & Erie.	267,834	333,429	Dec.. 65,595	19.6
Expenses	197,135	218,346	Dec.. 21,211	14.3
Net earnings	$80,699	$115,083	Dec.. $34,384	29.9
Per cent. of expe..	69.88	65.49	Inc .. 4.39	6.7
Second week in September:				
Atchison, Topeka & Santa Fe	$64,633	$40,964	Inc .. $23,669	57.7
Chicago & Alton	140,786	125,733	Inc .. 15,053	12.0
Ohio & Mississippi	90,720	91,517	Dec.. 797	0.9
St. Louis, Kansas City & Northern	74,206	69,127	Inc .. 5,079	7.4
Third Week in September:				
Chi., Milwaukee & St. Paul	$148,000	$181,900	Dec.. $33,900	18.6
Week ending Sept. 8:				
Great Western, of Canada	£16,479	£16,313	Inc .. £166	0.1
Week ending Sept. 9:				
Grand Trunk	£37,700	£36,000	Inc .. £1,700	4.7

Coal Movement.

The coal tonnages reported for the week ending Sept. 16 are as follows:

	1876.	1875.	Inc. or Dec.	P.c.
Anthracite	460,773	536,796	Dec.. 76,023	14.2
Semi-bituminous, Broad Top	3,970	.....	.....	....
" " Clearfield	23,125	22,705	Inc .. 420	1.9
" " Cumberland	42,059	55,152	Dec.. 13,093	23.7
Bituminous, Barclay	5,546	7,805	Dec.. 2,259	29.0
" Allegheny Region	3,490	38,691	Dec.. 2,228	5.8
" Pittsburgh Region	32,973			

The coal tonnage of the Pennsylvania Railroad for the eight months ending Aug. 31 was as follows:

	Tons.
Anthracite	451,359
Semi-bituminous, Broad Top	1 0,016
" " Clearfield and Snow Shoe	778,043
" " Cumberland	95,247
Bituminous, Gallitzin and Mountain Region	141,585
" West Penn. Div. and Soutwest Penn. Branch	170,703
" Penn and Westmoreland gas coal	526,817
" Pittsburgh Region	175,744
Total coal	2,449,514
Coke	520,088
Total coal and coke	2,969,602

Following the example of the Delaware, Lackawanna & Western and the Pennsylvania Coal companies, the Delaware & Hudson Canal Company has given notice of an auction sale of 100,000 tons of coal, which was to be held Sept. 28.

San Francisco coal receipts for August were as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Mt. Diabolo	11,270	12,038	Dec.. 768	6 4
Coos Bay, Bellingham Bay and Seattle	9,941	10,161	Dec.. 220	2.2
Eastern (Anthracite and Cumberland)	1,956	385	Inc .. 1,571	392.8
Vancouver's Island	8,120	7,032	Inc .. 1,088	15.5
Australian	26,337	9,613	Inc .. 16,724	174.2
English	19,914	11,464	Inc .. 8,450	73.5
Total	77,538	50,693	Inc .. 26,845	52.9

The total receipts for the eight months ending Aug. 31 were: 1876, 380,903; 1875, 344,334; increase, 36,569 tons, or 10.6 per cent. The total shipments from the Mt. Diabolo mines for the eight months were 76,860 tons. All this coal comes by water.

The anthracite tonnage of the Belvidere Division Pennsylvania Railroad for the week ending Sept. 16 was: 1876, 21,972 1875, 29,662; decrease, 7,690 tons, or 25.9 per cent. Of the tonnage this year 18,241 tons were Lehigh and 3,731 tons Wyoming coal.

At the Delaware, Lackawanna & Western auction sale in New York, Sept. 27, 100,000 tons were sold and the following prices obtained:

Steamboat, per ton	$2 87	to	$2 95
Grate	2 97½	"	....
Egg	3 15	"	3 30
Stove	3 90	"	4 00
Chestnut	3 20	"	3 32½

These prices, for all except steamboat and grate sizes, are a little higher than those obtained at the Pennsylvania Coal Company's sale last week.

Delaware Peach Traffic.

The shipments of peaches over the Delaware Railroad are now at an end for the season, although a few scattering cars may possibly be sent. The shipments for the season have been 2,250 car loads, against 8,250 last year, being a decrease of 6,000 car-loads, or 72.7 per cent.

Grain Movement.

Chicago receipts and shipments for the week ending Sept. 23 were:

	1876.	1875.	Inc. or Dec.	P. c.
Receipts	2,062,983	2,086,900	Dec.. 23,917	1.1
Shipments	1,849,242	1,830,470	Inc .. 18,772	1.0

Railroad Traffic.

The freight traffic of the Utah Central and Southern roads for August was as follows:

	1876.	1875.	Increase.	P. c.
Utah Central, tons	9,271	8,863	408	4.6
Utah Southern	6,580	6,216	364	5.9
Total	15,851	15,079	772	5.1

The principal item on the Central was 2,731 tons coal and coke; on the Southern, 2,831 tons ore and bullion.

The number of through passengers arriving in and departing from California by rail for the eight months ending Aug. 31 was as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Arrived	37,522	49,956	Dec.. 12,434	24.9
Departed	25,778	19,553	Inc .. 6,225	31.8
Total	63,300	69,509	Dec.. 6,209	8.9

During the same period 20,875 arrived and 7,185 departed by sea.

THE SCRAP HEAP.

Railroad Manufactures.

The Canada Steel Company, at Londonderry, N. B., is extending and completing its works. The works will be ready to start up in October and will have a capacity of 700 tons of steel per week.

The Cummings Car Works at West Bergen, N. J., have been idle for some time, and the buildings have recently been let to P. T. Barnum to be used as store-houses for his circus during the winter.

The Louisville Bridge & Iron Company has the contract for three spans 150 ft. long and one span 180 ft. long, through combination triangular truss bridges, on the line of the Burlington, Cedar Rapids & Northern Railroad, in addition to the one previously contracted for, and mentioned in a recent issue.

The rolling mill of E. & G. Brooke, at Birdsboro, Pa., is running full time and employing about 500 men.

The Jagger Iron Company, at Albany, N. Y., has put one of its furnaces in blast.

The rolling mill of Jacobs & Jackson, at Brownsville, Pa., is running double turn, and making light rails, bar and pipe iron.

The furnaces at Fort Edward, N. Y., at Cedar Point and one of those at Crown Point are running on Bessemer pig iron.

The furnace at Southfield, N. Y., is now in blast.

Porter, Bell & Co., at Pittsburgh, are building a shifting engine with 6 by 10 in. cylinders for the Pennsylvania Steel Company.

The Patten Car Works, at Bath, Me., have just shipped a complete train, consisting of baggage, mail and express car, two second-class and two first-class passenger cars, to the Quebec, Montreal, Ottawa & Occidental Railway. The cars have the Master Car Builders' standard axle, and are fitted with Miller platforms and the Smith vacuum brake.

The Baldwin Locomotive Works, at Philadelphia, complete their *four-thousandth* locomotive this week. The event was to be celebrated on September 28, "Pennsylvania Day," by a visit of the employes of the works to the Centennial grounds in procession. The four thousand locomotives have been built in 45 years, from 1831 to 1876.

The Wythe Speed Recorder.

An officer of the Atlantic & Great Western road writes to us as follows of the Wythe Railway Speed Recorder:

"It is doing excellent service on this line and is demonstrating every single item claimed for it. Trains with the recorder on them are allowed to run 20 miles an hour as against those without it running 15, and *no train* protected by the recorder *has ever had a wheel off*. For nearly two years' service for several of the machines, and over a year for a considerable number of them, it shows that it is not a matter of co-incidence, or happen-so, that they have been free from casualty. Of course it does not prove that nothing *will* ever happen to them, but it shows that the liability for accident is 'reduced to a minimum,' as the advertisement says, and the dollars and cents saved can only be guessed at.

* * * *

"A rear collision occurred a few weeks since (Aug. 17), which, while strictly an exception to the remark about freedom from accidents, still is true in the sense of happening through no fault or by reason of recorder. Train No. 38, way freight, going east on First Division, with speed recorder on its caboose, stopped at Venango to do some work. Train No. 36 following, but without speed recorder, came down to station at a very fast rate of speed, not expecting to find No. 38 at that point, and before being able to stop, ran into No. 38, badly demoralizing its caboose and several freight cars, as well as the locomotive of No. 36.

"The case was so apparent as one of fast running on the part of No. 36, that the universal remark at the time was *that the recorder was on the wrong caboose.*

"It was fully apparent also, from the distance between where No. 36 first sighted No. 38, that had No. 36 been going even at 18 or 20 miles per hour, with men at their places (as the recorder compels them to be), they could easily have stopped before collision occurred."

A Revolving Axle.

Messrs. Baker, Smith & Co., the well-known manufacturers of hot-water car heaters, have on view at their establishment, corner of Green and Houston streets, New York, a pair of car-wheels on what they call a revolving axle which have been in use four years and three months under a New York, New Haven & Hartford Railroad freight car. The axle is arranged so that the wheels can revolve independently of each other. Neither they nor the axle seem to be much worn, and appear to be capable of enduring still more service. As our readers know, we are not believers in the advantages of loose wheels, but if we are mistaken, and axles which will permit the wheels to revolve independently of each other are to be used, the plan shown by Messrs. Baker, Smith & Co. seems to be a very good one, and has the advantage of practical use to recommend it.

The Oldest Conductor.

The Randolph (N. Y.) *Register* says: "The oldest conductor in the United States passes Randolph every day. His name is Isaac Woods, and his home is at Salamanca. He is 62 years of age, and has been on different railroads for over forty years. In all this time he has never wrecked a train or met with any accident of any kind. He is one of the most faithful conductors on the Atlantic & Great Western road, and is content to die in the harness."

The Handyside Steep-Grade Engine.

The *Engineer* says that a locomotive fitted with the patent apparatus of the Handyside Steep Gradient Company of Bristol is now working both passenger and goods traffic for the London & Northwestern on the Hopton incline of the High Peak Railway, Derbyshire. This is an incline of one in fourteen, or 374 feet per mile.

Milwaukee Iron Company.

At the meetings of the stockholders and creditors in Milwaukee, Sept. 20, nothing definite was done, and adjourned meetings will be held Oct. 5. In the creditors' meeting a general disposition to give the company time was manifested. The stockholders received favorably, but did not act on, a proposition to issue 20 per cent. additional stock, the amount to be paid in cash, in order to keep the works in operation.

Total Abstinence in Railroad Men.

W. J. Spicer, Superintendent of the Grand Trunk Railway, has issued a circular to his subordinates, in which he says: "Moderate drinking too frequently induces sleep or perhaps a foolhardy indifference and recklessness, either of which condition is alike dangerous in connection with the movement of trains. The importance of total abstinence, particularly among railway employes, cannot be over-estimated; the experience of the last three years has so convinced me of its good effects that I have determined to renew my pledge for another year, and I hope that the assistant superintendents, agents, trainmen and the traffic staff generally, will join heartily with me in the movement."

Lumber Traffic by Rail.

The New York *Daily Bulletin* learns that the New York Central & Hudson River Company made a contract about the first of May with mill-owners at Windsor, Ont., opposite Detroit, for the carriage of 3,000 car loads of white pine deals to New York for export to England, their shipments having previously been by lake and river to Quebec. The lumber is brought from the lumber ports of Michigan to the Canada Southern Railway at Amherstburg; goes thence by rail to New York, where it is shipped in sailing vessels to England. These rail shipments are looked upon as experimental as yet.

Prices.

The *Engineering and Mining Journal* notes the sale of 500 tons of iron rails by the Harrisburg Mills for delivery in Philadelphia at a price equivalent to $36 a ton at the mills. It is reported that for 10,000 tons of steel rails recently sold to the Southern Pacific the price realized was but $49 at the mills. New York quotations are $36 to $49 for iron, $52 to $54 for steel, $20.50 to $21 for old rails and $27 for scrap.

OLD AND NEW ROADS.

Manchester & Keene.

A serious riot occurred among the men employed on this road Sept. 20, when some 350 of them, chiefly Italians, left their work and went to the town of Keene, N. H., where they made quite a formidable demonstration. The militia were called out, but no collision occurred, the men having been persuaded to return to work. The cause of the trouble was that the men had not received their pay for August. The sub-contractor claims that he has not received money from the contractors as promised and is consequently unable to pay the men. The men are reported to be still uneasy and further trouble is feared.

Pennsylvania Transportation Company.

The construction of this company's proposed pipe line to the seaboard cities will probably be delayed by legal proceedings. The Pennsylvania Railroad Company has applied to the Attorney General of the State for proceedings in the nature of a *quo warranto* to test the authority for the construction of the new line.

Woodlawn & Newton.

Arrangements have been made to organize a company and make a preliminary survey for a narrow-gauge road from Woodlawn, N. C., on the Carolina Central, northwest to Newton on the Western North Carolina road. The distance is about 40 miles.

New Jersey Midland.

The following statement, covering the months of June, July and August, is prepared from figures furnished to us by the Receivers. For the three months the actual earnings and expenses of the road were as follows:

Passengers	$43,906 27
Freight	68,980 39
Milk	56,765 52
Miscellaneous	13,438 58
Total	$183,090 76
Deduct drawbacks, overcharges, advance freights, Montclair R. R. proportion of terminal charges, etc	30,881 03
Balance	$152,209 73
Operating and terminal expenses and repairs	103,485 31
Net earnings	$48,724 42

The gross earnings compare with those of the corresponding months in 1875 as follows:

	1876.	1875.	Increase.	P. c.
June	$56,119 76	$41,615 03	$14,504 73	34.9
July	64,546 47	45,854 39	18,792 08	40.9
August	62,324 53	46,443 63	15,880 90	34.2
Total	$183,090 76	$133,913 05	$49,177 71	36.7

which may be considered an excellent showing, especially when it is remembered that the ore traffic has not been heavy, and the season a very unfavorable one for the milk business.

The Receivers' cash account may be summed as follows:

Cash on hand June 1	$531 36
Road receipts	183,090 76
Receipts from loans, etc	56,376 88
Total	$239,999 00
Disbursements on all accounts, including loans paid	239,773 34
Balance, Sept. 1	$225 66

The disbursements include $25,109.75 on account of construction (permanent improvements); $10,537.32 on equipment account; $5,960.35 in payment of right of way claims, and $8,700 rental for Middletown, Unionville & Water Gap road.

The Bondholders' Committee has recently issued a circular in which they say that they have endeavored to hasten the proceedings to foreclose the first mortgage. They have obtained a standing in Court in order to resist a claim for $125,000, which

they believe to be unjust. This, however, will make no material delay in the proceedings, the hastening of which depends mainly upon the trustees under the mortgage. The committee now holds or controls two-thirds of the first and a majority of the second-mortgage bonds.

As to the road, the circular says: "The road is doing a fair business, considering the state of the times and the long drought of the past summer; but we are expecting improvement in the management by the Receivers which will materially increase the net earnings. There is a considerable surplus of earnings over expenses, but it is necessary to apply such surplus to repairs and improvements, and to acquiring title to a portion of the right of way not hitherto paid for.

"The condition of the property is constantly improving, and it is confidently expected that its ability to earn money next season will be very largely increased."

Canada Southern.

The telegraph lines owned by this company have been withdrawn from the Atlantic & Pacific offices, and will hereafter connect with the Western Union Telegraph Company's offices and system of lines.

Toronto, Grey & Bruce.

At the annual meeting in Toronto, Ont., Sept. 13, the President reported that the necessary assent had been obtained to the reorganization of the capital account; the new stock and bonds had been issued, and most of the old issues cancelled. Arrangements for the funding of the floating debt had nearly been completed. The new issue of stock amounts to $1,000,000, and the bonds to $2,000,000, of which $1,600,000 have been or are to be exchanged for the various issues of bonds previously made, and $400,000 used in funding the floating debt.

New Jersey & New York.

In the matter of the application of the Receiver, Mr. Valentine L. Lary, for an injunction to restrain the National Trust Company, of New York, from selling $100,000 bonds of the company deposited with it as collateral for a loan of $25,000, Judge Westbrook, of the New York Supreme Court, last week refused the injunction, but granted a stay of proceedings until an appeal could be taken to the General Term of the court.

Lockport & Buffalo.

The Supreme Court has dissolved the temporary injunction granted to restrain the city of Lockport from issuing its bonds in aid of this road. The Court held that the contract between the city and the company was duly executed Nov. 6, 1871, and the city became a stockholder on that day, consequently the contract could not be affected by the constitutional prohibition against municipal aid to railroads, which did not take effect until Jan. 1, 1875.

New York & Oswego Midland.

The following figures have been published for the ten months from Oct. 1, 1875, to July 31, 1876:

Gross earnings ($1,951 per mile)		$436,313 82
Expenses (86.69 per cent.)		378,224 54
Construction	$31,210 07	
Taxes	31,519 89	
Discount and interest	3,181 12	
		65,911 08
Deficit		$7,821 80

For the seven months of 1876 included in the statement, the gross earnings were $276,431, and the net earnings $22,472, the expenses being 91.88 per cent. of earnings.

The Utica *Herald* of Sept. 25 says: "The final decree in the case of the New York & Oswego Midland Railroad has been settled, and an engrossed copy of it will be presented for signature to Judge Blatchford, of the Southern District United States Circuit Court, pursuant to his directions, on Oct. 2, at 11 a. m., in New York city. A copy of the decree, as prepared by Alexander & Green, attorneys for the Receivers, is now before us. It is a document of 28 printed pages, and describes the property of the road which is to be sold at public auction under this decree at Middletown, Orange County, under the direction of Kenneth G. White, at such date as Mr. White shall fix and after public notice of the sale shall have been published for fifteen successive weeks in the newspapers of New York, Utica, Albany, Oswego, Norwich and Middletown. The property to be sold includes not only all the franchises, rolling stock and other property of the main line, but the leasehold or other privileges or rights under leases or contracts made by the Rome & Clinton Railroad, the Utica, Clinton & Binghamton Railroad, and the several other roads which were operated by the Midland before it passed into bankruptcy. While the decree provides that all this immense property shall be sold as one parcel, it also stipulates that the leasehold interests in the Rome & Clinton, the Utica, Clinton & Binghamton roads may be sold separately, if the complainants (namely, the receivers) so direct or assent.

Dividends.

Dividends have been declared by the following companies:

Camden & Atlantic, 2 per cent., quarterly, payable Oct. 16.

Ogdensburg & Lake Champlain, 4 per cent., semi-annual, on the preferred stock, payable Oct. 1.

Housatonic, 2 per cent., quarterly, on the preferred stock, payable Oct. 10.

Boston & Albany.

The Boston *Adver iser* of Sept. 26 says: "The new tracks of the Boston & Albany road at Worcester, between the new union station and the junction, were completed Saturday. By this change the Boston & Albany road have now abandoned their old south track, which is to be used by the Norwich & Worcester road, and their old north track is to be kept as 'spare' until after the viaduct connections are made, when it is to be used for the inward western freight business of the Boston & Albany road. By this arrangement of tracks at the junction the connections between the Boston & Albany and Worcester & Nashua roads are cut off, and, until the viaduct is completed, the exchange of freight between these roads will be through the union station."

Boston, Winthrop & Point Shirley.

The Boston *Advertiser* says: "We print in another column the report of the board of railroad commissioners, of an investigation made by them in the affairs of the so-called 'Boston, Winthrop & Point Shirley Railroad Company.' This is a document to which parties undertaking to construct railroads under the general law will do well to give especial heed. If any such parties have been under the impression that the general law was equivalent to no law at all, this manifestation of the watchful supervision of the railroad commissioners will operate to free them from a mischievous delusion.

"It seems that the successful operation of the Boston, Revere Beach & Lynn Railroad Company so far turned the heads of some of the good people of the town of Winthrop, that they became eager that their town should be connected by a narrow-gauge track with the similar track between Boston and Lynn. With this object in view, the skeleton of an organization under the general railroad law was set up. The company was to have a capital of 1,000 shares. One hundred and thirty-three of these shares were in good faith subscribed for in small lots by about 25 different persons. The residue, 867 in number, were taken in a lump in the name of John L. Butman, of Fitchburg, who had surveyed the route, and who expected to be the contractor to build the road. The town of Winthrop entered into a contract with this same individual, to sell to him for a nominal consideration all its interest under a foreclosure of a mortgage of $20,000 in the existing Winthrop street railway, and to procure for him a right of way for the proposed line; certain stipulations for the operation of a portion of the line with steam power, and for the discontinuance of a portion of it, being the equivalent under the contract. The same Mr. Butman then contracted with the company (in which he was a shareholder to the extent of 867 shares out of 1,000) to assign to it his contract with the town for $65,000, and to build and equip the road for the further sum of $67,000.

"A preliminary assessment of 10 per cent. on the shares of the company had already been made; the remaining 90 per cent. was now called up and some bank notes were temporarily borrowed and immediately returned, after the fashion of some of the earlier proceedings of the contractor for building the Troy & Greenfield Railroad, in order that payments 'in cash' might be made on the contractor's shares, while in point of fact transaction was merely an exchange of receipts; the treasury of the company was left bare, and no progress had been made toward building the road.

"To provide funds for this purpose the use of bonds was contemplated, and an issue thereof at the rate of 90 was actually negotiated, the bonds having been printed. Extraordinary inducements were offered for the negotiation and sale of the bonds; but happily the investigation was interposed before they were thrown upon the market in any considerable quantity.

"The railroad commissioners say that they 'can take but one view of these proceedings. Throughout they were colorable, evasive of the law and fraudulent as respects both the corporation and the public.' The salutary provision of law which requires that the par value of all shares must be paid into the treasury of the corporation, in cash, has been wholly disregarded, a neglect which renders the directors liable to a heavy penalty; but so much irregularity is connected with the whole of the proceedings, that it may be doubted whether any corporation at all legally exists. The outstanding certificates of stock are directed to be recalled and cancelled, and new certificates to be issued, credited only with payments actually made in cash. The facts are presented to the Attorney-General.

"By this thorough and comprehensive investigation of a nascent fraud, the railroad commissioners have given new proof of the usefulness of their functions. Such transactions as were here attempted cease to be mischievous when brought into full light, but nothing except the comparative pettiness of the sums involved removes them from the rank of the gigantic schemes of stock-watering which have disgraced the railroad annals of the country. It is gratifying to find that, with the freedom of action permitted by the general law for the construction of railroads, we have also a piece of simple administrative mechanism which is potent to afford the necessary regulation to prevent fraud and disaster."

Green Bay & Minnesota.

The La Crosse Extension is completed and trains were to begin running through to La Crosse this week. The new line is 6¾ miles long and extends from the Chicago & Northwestern at Onalaska southward to the city of La Crosse. To reach it the Green Bay company uses 23.2 miles of the Northwestern track, from Marshland to Onalaska. The grading of the new line was not very heavy, but there are on it seven bridges, four of which are pile bridges from 60 to 120 feet long; one a pile bridge 500 feet long; one a pile bridge 675 feet long, and one, over the La Crosse River, a Howe truss of 132 feet span. At La Crosse the company has completed a turn-table; a passenger depot 26 by 56 ft., with train-shed 46 by 214 ft., and a freight house 80 by 24 feet. This extension gives the company a second terminus on the Mississippi, the other being at Winona, Minn. The company received a subsidy of $75,000 from the city of La Crosse in aid of the extension.

Holyoke & Southern.

Mr. John Sprague, of Conway, Mass., has completed the surveys of this projected line from Holyoke, Mass., southward to New Haven and north to Turner's Falls, and is now preparing maps of the line. He also proposes three routes for its extension northward into Vermont. The first is by way of Conway and Shelburne Falls to a connection with the projected Green Mountain road; the second by Greenfield and up Green River through Halifax and Marlboro to Wilmington, Vt., where it meets the Green Mountain line, and the third up Fall River through Guilford to Brattleboro, thence up West River to Londonderry. The project is to unite with the Green Mountain Company and make a narrow-gauge line from New Haven to Montreal, with a possible extension from New Haven to New York and branches all over Massachusetts and Vermont.

Pacific, of Missouri.

The claim of St. Louis County against this road for $700,000 was argued before the United States Circuit Court in St. Louis last week. Counsel for the county asked for an order directing the payment of interest on the county bonds to date and setting forth the lien of the county upon the road. Sept. 25, the Court, while not giving a final decision in the matter, announced that it held the county's claim to be secured, it constituting a lien on an equitable charge.

It has heretofore been stated that the Garrison plan of reorganization included provision for this claim, but the County Court desired to have it secured by order of Court, so as to prevent any attempt to evade it. The claim is based upon an issue of bonds made by the county in aid of the road.

Syracuse, Binghamton & New York.

Notice is given that the first-mortgage bonds of this company will be paid on presentation at the office of the Treasurer, No. 26 Exchange Place, New York, Oct. 2. Interest will cease at maturity. By the latest report the amount of these bonds was $1,400,000, the principal being due Oct. 1, 1876. The road is worked by the Delaware, Lackawanna & Western.

Chicago, Rock Island & Pacific.

On the extension of the Oskaloosa Branch westward track is now laid to Olive Branch, Ia., 10 miles from Oskaloosa. The work has advanced but slowly for a month past, having been much delayed by heavy rains.

Missouri & Western.

The work of extending this road (formerly the Memphis, Carthage & Northwestern) from Brownsville, Kan., west to Oswego is now progressing well. Most of the grading is done, and tracklaying will be begun this month. The contractors are Hobart & Condon, of Oswego, Kan. It is said that a further extension through Independence to the Arkansas River is under consideration.

Central, of New Jersey.

The new $5,000,000 mortgage has been duly executed and recorded in the various counties of New Jersey through which the road runs. It is made as set forth in the recently published statement of the company and is to Samuel Knox and John Kean, of Elizabeth, N. J., as trustees, Mr. Knox being Treasurer, and Mr. Kean a director of the company. It is said that none of the bonds have been negotiated yet.

European & North American.

At Bangor, Me., Sept. 22, Judge Libbey, of the Supreme Court, granted an injunction asked for by the trustees under the second mortgage, and appointed N. C. Ayer, W. B. Hayford and Noah Woods Receivers of the section of the line in Maine, from Bangor to Vanceboro. The second mortgage is a prior lien to the consolidated mortgage, the trustee under which has had possession of the line for several months past. The new Receivers are to take possession Oct. 1. It is probable that the consolidation will be set aside and separate decrees of foreclosure obtained in Maine and New Brunswick, in which case two new companies will probably be organized. The Maine second-mortgage bonds are principally held in Maine and in Boston, while the New Brunswick bonds are held in England.

Railway Mail Service Compensation.

The Commission on Railway Mail Service met in Cleveland, O., Sept. 23, and received a committee appointed by the Board of Trade and deputations from the leading mercantile and banking interests of the city, who made statements in regard to the necessity of increased mail facilities. All agreed and were of the opinion that there was nearly twenty-four hours difference in the receipts of the mails from New York and the Eastern States by the fast mails, and the same time saved in the remittances of exchange and in the collection of drafts and checks from the towns on the lines of fast mails, and that the saving of interest alone was much more than the entire cost of the fast mail service. Postmaster Sherwin also explained the advantages derived from the fast mail system and the loss and inconvenience from its discontinuance.

The Commission met again in Chicago, Sept. 25. Statements were received from Postmaster McArthur, of Chicago; John M. Hubbard, also of the Chicago office; Hugh Riddle, Vice-President and General Superintendent of the Chicago, Rock Island & Pacific; George S. Bangs, late General Superintendent of Railway Mail Service, and others. The Commission expected to remain in Chicago all this week, with the exception of a day's visit to Milwaukee on Sept. 27.

New Orleans Pacific.

The grading of this road is now completed for 40 miles west of Alexandria, La., and about 600 men are at work. On the line from Alexandria southeast to Bayou Goula, where connection is to be made with the New Orleans, Mobile & Texas, a large part of the work is done, and the rest can be completed in a short time, as the work is very light.

Texas & New Orleans.

The reconstruction of this road is now completed from East Liberty, Tex., to Beaumont, 44 miles. From Orange westward the track is completed 18 miles, leaving only six miles to reach Beaumont. The old track from Houston to Liberty, which has always been in use, is being repaired and put in good order. An additional engine and several cars have been received.

International & Great Northern.

The grading on the Austin Extension is now completed to Duval, Tex., 11 miles westward from the terminus at Round Rock, and tracklaying is in progress. No work is being done between Duval and Austin, the trouble about the right of way not having been settled.

St. Louis, Kansas City & Northern.

In the United States Circuit Court in St. Louis, Sept. 21, Judge Dillon decided the case of Henry E. Eakin against the St. Louis, Kansas City & Northern Railway Company, to recover the interest upon coupons attached to $937,000 worth of bonds issued by the St. Louis, Council Bluffs & Omaha Railroad Company. The latter company leased their road to the former for rental equal to the interest on these bonds, and said interest was to be paid as the rental of the road. This lease was made with the consent of the stockholders of the St. Louis, Council Bluffs & Omaha road, but the stockholders of the St. Louis, Kansas City & Northern took no formal action on it until March, 1875, when they voted it down, although the company had made three semi-annual payments of interest on the bonds without objection from any of the stockholders. Judge Dillon decided that, notwithstanding the informality of the lease, as the latter company had operated the road of the former and made three payments of interest on the coupons, the lease is valid, and judgment was entered for the plaintiff.

The opinion of the Court is summed up as follows in its concluding paragraph: "Admitting that the *directors and officers* of the defendant company, under the act of 1870, above quoted, could not rightfully consummate and *perfect* a lease of another railroad company without the assent of the stockholders given as therein provided, yet having undertaken to do, in execution of the agreement of August 13, 1871, and having reported that fact to the *stockholders* at their annual meeting in 1873 and in 1874, the defendant company having availed itself of the benefit of the lease and operated the leased road thereunder, and carried out the provisions of the lease by making three semi-annual payments of interest on the coupons—all with the knowledge of, but without objection from the stockholders—this court, guided by the principles sanctioned by the supreme court in the quite analogous case of Zabriskie vs. Cleveland & C. R. R. Co., 23 Hon., 381; reasserted and applied in Bissell vs. Jeffersonville, 24 Hon., 287-300; Supervisors vs. Schenck, 5 Wall, 772; R. R. Co. vs. Howard, 7 Wall, 412; Pendleton Co. vs. Arny, 13 Wall, 305, and other cases, is of opinion that the lease in question has been, as in law it may be, ratified by acquiescence and action thereunder, as respects the innocent holders of bonds in question, and that the defendant company is estopped to insist as to such holders, that the lease is void because not formally assented to by the stockholders by an express vote or writing. This provision is intended for their protection, and they may renounce or waive its benefits, or may become estopped by their laches, acquiescence and conduct from insisting upon its use as a sword to cut down the rights of others. Judgment for plaintiff."

The road in question is 42 miles long, from Chillicothe, Mo., to Pattonsburg.

Eldorado & Walnut Valley.

A company by this name has been organized in Kansas to build a railroad from Elinor, on the Atchison, Topeka & Santa Fe, 15 miles west of Emporia, southward through Chase, Butler and Cowley counties to the Indian Territory line, about 100 miles. There is also to be a branch to Eureka, in Butler County, 22 miles. It is intended to make the road of standard gauge and a branch of the Atchison, Topeka & Santa Fe.

Dayton & Southeastern.

The work on this road is progressing steadily, and track is now being laid from Xenia, O., eastward. The grading and bridging of the 30 miles from Xenia to Washington Court House is nearly all finished, and it is expected that that section will be completed in October. Between Dayton and Xenia there is still much grading to be done, but a large force is at work and the ties and rails have been contracted for.

Syracuse, Phœnix & Oswego.

There is talk of a resumption of work on this road, which was partly graded some years ago, and which is to extend from Syracuse, N. Y., northward to the New York & Oswego Midland near Phœnix, forming a second line from Syracuse to Oswego. It is said that when the reorganization of the Syracuse & Chenango is completed that company will take an interest in the Oswego line.

Burlington, Cedar Rapids & Northern.

The bondholders' committee has issued a farewell circular to the bondholders. After reciting the purchase of the road and the organization of the new company, the circular says:

"Bonds to the amount of eight millions have been deposited, with the Continental Bank, under the plan of reorganization. It is advisable that the bonds outstanding be deposited without delay. It will require several months to engrave the new

bonds and certificates of stock, but they will be distributed as soon as possible. The policy of the committee, from the first, has been to keep the bondholders informed, as far as possible, of all matters bearing upon their interests. In pursuance with this policy, a statement is submitted herewith, showing the various suits pending against the company at the time of the sale. The purchase of the property was made, subject to whatever may be the decision in these suits by the Court. It is proper in this connection, however, to state that the expressed opinion of our counsel is, in effect, that not one of these suits will be decided against the company. It is to be hoped that this opinion will be verified. It is now more than a year since the bondholders' committee commenced its labors. With the foreclosure of the mortgage, and the purchase of the property for the bondholders, the work of the committee is ended."

The suits referred to are divided into two classes. The first class includes mechanics' liens under the Iowa law, amounting in all to $182,516.85; the second class is for recovery of claims against the Receiver, amounting to $139,686.92, making $322,203.77 in all.

Lake Superior & Mississippi.

The bondholders' committee reports that a large majority of the parties in interest have assented to the plan of reorganization, including holders of $4,009,500 out of $4,500,000 first-mortgage bonds. The committee is now duly authorized to buy the road at foreclosure sale and to reorganize under the plan. The necessary legal proceedings have been begun in the United States Court at St. Paul, Minn., and it is expected that a decree of foreclosure and sale will be granted at the December term. The committee hopes that the reorganization will be completed early in 1877.

Pittsburgh, Virginia & Charleston.

Work has been begun on an extension of this road from its present terminus at Monongahela City, Pa., southward up the Monongahela River to Brownsville, about 20 miles.

Western Counties.

Track is now laid to a point 45 miles northward from Yarmouth, N. S., reaching nearly to the Sissiboo River. There is still a heavy cutting to be completed before the river is reached. The contractor on the Sissiboo bridge began work some time ago, but will probably not have it completed before spring. A force has recently been put on the northern end of the line, between Digby and Annapolis. The track laid on the southern end is now being ballasted.

Indianapolis, Peru & Chicago.

This company has resolved to burn coal exclusively in its engines hereafter, and the necessary changes in the engines are to be made as fast as possible. No more wood will be bought for fuel. There are 28 engines to be altered.

Boston, Revere Beach & Lynn.

There is talk of extending this narrow-gauge road from its present terminus at Lynn, Mass., northward through Swampscott, Peabody and Salem to Newburyport, with a branch from Lynn to Nahant. From Lynn to Newburyport the distance is about 25 miles, through a district already well served by the Eastern Railroad and its branches.

Potomac, Fredericksburg & Piedmont.

A contract has been let to Barton Jones, of Fredericksburg, Va., to complete the grading of this road from Parker's Store to Orange Court House, Va., 14 miles. This section was partially graded four years ago. The contract for the trestle-work for the same section is let to Cammack & Reynolds, of Spotsylvania.

Dutchess & Columbia.

The New York Central & Hudson River Company has notified the Receiver of this road that he must discontinue the use of the Central track and other property at Dutchess Junction. The Central claims the ownership of the wharf property at that point.

Pennsylvania.

The following statement, showing the present immense travel between New York and Philadelphia, is published; it covers the operations of the New York Division for the 24 hours ending at midnight of Tuesday, Sept. 19:

	East-bound.	West-bound.	Total.	No. of cars moved.
Through passenger trains	36	34	70	700
Local passenger trains west of Trenton	40	38	78	711
Local passenger trains east of Trenton	48	45	93	
Through freight trains	6	12	18	493
Local freight, coal and distributing trains	61	78	139	2,310
Totals	191	207	398	4,214

In addition to these main-line trains there were 22 branch trains, making a total of 420 trains moved on the division. The runs of the local trains vary from 10 to 60 miles. The total number of passengers carried during the 24 hours, not including commuters, school children and free passengers, was 45,000, for which over $50,000 were received. At one time there were 20 passenger trains in motion in one direction between Monmouth Junction and Mantua, 45 miles.

The Main Line is 89 miles long, and there are five branches varying from three to eight miles, making 119.9 miles in all. The Main Line is all double track with several long sections of third track.

On Sept. 23 there were 20,000 through passengers carried from Philadelphia to New York in 39 trains, 33 of which arrived in Jersey City by 6 p. m. To meet the demand for cars 58 empty cars were returned from Jersey City to Philadelphia between 9 and 10 a. m., leaving the Jersey City depot in from four to ten minutes after their arrival there loaded.

Elizabeth City & Norfolk.

At an election held Sept. 18 the people of Pasquotank County, N. C., voted to subscribe $50,000 in county bonds to the stock of this company. The bonds are not to be issued until the road is completed and the cars running.

St. Louis, Keokuk & Northwestern.

The recent high water carried away one span of this company's bridge over the Des Moines River at Keokuk, Ia., and threw another span out of place. The span carried away was recovered and towed ashore, but only the timbers are fit for use, and both spans must be taken apart and rebuilt. The loss is estimated at $10,000. A temporary trestle bridge has been erected.

Gulf, Western Texas & Pacific.

The Galveston *News* says: "The Indianola & Cuero (or Morgan) road is advertised at public auction in the City of New York on the 19th of December, proximo."

The road is 70 miles long, from Indianola, Tex., to Cuero. It is not now worked, trains having recently been withdrawn.

Peoria, Pekin & Jacksonville.

Mr. John Allen, President of this company, which was originally organized as successor to the Illinois River Company, has filed a bill in chancery in the United States Circuit Court at Springfield, Ill., to recover $60,000 from Morgan County, Ill. Mr. Allen sues as a creditor of the old company, the facts being that, in 1865, Morgan County subscribed a certain amount of bonds to aid the Illinois River Railroad, but afterwards these bonds were withdrawn and cancelled; but now Allen claims that the bonds were a part of the assets of the company, and that he, as a creditor, had a lien on them, and that the bonds were illegally cancelled. He therefore sues the county for the amount of his claim. The case was heard Sept. 19, and a decision is expected soon.

St. Paul & Sioux City.

The operations of this road for August were as follows:

Freight earnings		$30,578 67
Passenger		11,312 85
Express, mails and miscellaneous		2,189 34
Total earnings ($361 per mile)		$44,080 86
Working expenses (69 per cent.)		30,350 86
Net earnings ($113 per mile)		$13,730 00
Rents received		159 65
Balance from July		84,432 73
Total		$98,322 38
State taxes	$881 62	
Insurance	308 35	
Interest on floating debt	33,272 35	
		4,462 32
Balance to September		$93,806 06

Being an increase of $9,427.33 during the month. As compared with August, 1875, there was a decrease of 1.1 per cent. in gross and 11.3 per cent. in net earnings. For the eight months ending Aug. 31 the road earned $360,977.81 gross and $120,563.03 net, being an increase of 21.1 per cent. in gross, and 160.6 per cent. in net earnings.

Winona & St. Peter.

There is a report that a branch is to be built from Sleepy Eye Lake, Minn., northwest to Redwood Falls, about 30 miles, the object being to open lands of the company to settlement.

Eureka & Palisade.

Officers of this company have recently been viewing the country south of Eureka, Nev., and it is said that surveys will be made for an extension of the line through southern Nevada to the Colorado River. The nearest point on the river is about 250 miles south by east from Eureka.

Portland, Dalles & Salt Lake.

A dispatch from Beaver, Utah, says that the survey and location of this road from Corinne, Utah, to Snake River, Idaho, 125 miles, is nearly completed. It has been made by a party under charge of C. L. Ericson. The line is said to be of very similar character to that of the Union Pacific along the Platte River in Nebraska. A contract for the grading of this section has been made with Alexander Toponce, who agrees to have 50 miles, from Corinne to Malade City, completed by Dec. 15, 1876, and the rest of the line, from Malade to Snake River, by Oct. 1, 1877. The contractor was to begin work Sept. 25.

The company has lately been reorganized, and will hereafter be known as the Portland, Salt Lake & South Pass Railroad Company.

Louisville, Cincinnati & Lexington.

The holders of the first-mortgage bonds have concluded an agreement for the purchase of this road and the reorganization of the company, which is substantially as follows:

1. George L. Douglass, of Louisville, and E. D. Sayre, of Lexington, Ky., are appointed agents and trustees to carry out the agreement.

2. They are authorized to buy the road at the foreclosure sale, which is to take place Dec. 4, at a price not to exceed the amount of the first-mortgage bonds and accrued interest and such liens as may be prior thereto.

3. Should they buy the road they are to organize a company under the Kentucky law providing for such cases and to transfer the property to such corporation.

4. The capital stock of the new company is to be not less than the amount paid for the road, and may be greater if deemed advisable.

5. Each subscriber to the new company shall be a holder of an amount of stock proportional to the amount of bonds held by him, and shall be liable to an amount sufficient to pay his share of the installments of the purchase money of the road as they may become due.

6. Stock in the new company shall be issued as soon as its organization is completed.

7. Each bondholder, on signing the agreement, shall deposit his bonds with the trustees and pay an assessment of $1 per bond. The bonds are to be deposited in the Northern Bank of Kentucky at Lexington, or the Louisville Savings Bank. The money is to be used to pay necessary expenses of reorganization. A memorandum receipt will be given and the bonds and unexpended balance of money will be returned if the road is not purchased.

8. If the purchase is made, the bonds deposited will be held as a pledge for payment of the assessments on the new stock as they become due.

9. The corporation shall have power to use net earnings of the road to pay installments of purchase money; also to execute a new mortgage and borrow money thereon. No assessments shall be made on the stock after the purchase money is paid.

10. The agreement shall not be binding unless signed by holders of $1,500,900 of bonds. The trustees are authorized to receive money subscriptions to the stock of the new company, provided $1,500,000 bonds are not deposited by Nov. 25; such money subscribers to pay in 20 per cent. of their subscription in cash.

11. An Advisory Committee is appointed, consisting of John W. Barr and John Churchill, of Louisville, and M. C. Johnson, of Lexington, with power to assist the trustees in their work; to decide in case of a difference of opinion between the trustees, and to fill vacancies, should any occur.

12. The new corporation is to have all the necessary and usual powers and to succeed to all the franchises, etc., of the old company, so far as the law permits.

13. The powers granted by the agreement shall be irrevocable.

Mr. E. D. Sayre will receive bonds and signatures to the agreement at the banking house of D. A. Sayre & Co., Lexington, Ky., and Mr. George L. Douglass at the Louisville City National Bank, Louisville, Ky.

New York Central & Hudson River.

Vice-President Wm. H. Vanderbilt addressed the following letter to the New York *Times* under date of Sept. 23:

"Frequent statements have recently appeared in the daily papers concerning the New York Central & Hudson River and the New York & Harlem railroad companies. These articles are intended to excite distrust as to the earnings and properties of the companies, and are evidently written for speculative effect. As holders of investment securities are in these times easily alarmed, and some have been and others may be led to sacrifice their stock through misrepresentations and misapprehensions, I take this method of informing the stockholders of both companies, and in answer to all charges and statements, that the New York Central & Hudson River Railroad Company has paid all its dividends and interest from its net earnings, and from no other source whatever.

"We have, during the past year, gone through a period of unusual depression, and at the same time have asserted and maintained a policy which we believe vital not only to the New York Central & Hudson River Railroad Company, but to New York City and the whole country. Notwithstanding the unprecedented condition of affairs, the company has met all its engagements and earned and paid its usual quarterly dividends, and its business gives every assurance that it will be able to continue to do so.

"The Harlem lease has not been any loss to the New York Central & Hudson River Railroad Company. The New York & Harlem Railroad Company has earned the 8 per cent. guaranteed by the New York Central, and 2 per cent. additional has been earned by its city line."

Sioux City & St. Paul.

The operations of this road for August are reported as follows:

Freight earnings		$15,514 89
Passengers		7,602 10
Express, mail and miscellaneous		2,871 46
Total earnings ($175 per mile)		$25,988 45
Working expenses (75 per cent.)		19,128 37
Net earnings ($42 per mile)		$6,860 08
Rents received		78 00
Equipment bond sinking fund		1,231 34
Balance from July		15,010 60
Total		$23,180 02
Elevator rents	$268 33	
Illinois Central track rent	1,605 00	
State taxes	759 90	
Insurance	200 00	
Special equipment fund	2,448 00	
		5,281 23
Balance to September		$17,898 79

Being a gain of $2,888.19 during the month. As compared with August, 1875, there was an increase of 4.5 per cent. in gross and a decrease of 26.8 per cent. in net earnings. For the eight months ending Aug. 31 the road earned $218,332.89 gross and $50,850.43 net, against $157,816.95 gross and $11,146.61 net in 1875.

Rock Island & Mercer County.

The grading of this road is almost completed from the junction with the Peoria & Rock Island road at Milan, Ill., five miles southeast from Rock Island, southward to Waugh's Mills. The last-named place is to be the terminus, and is 21 miles from Milan. There are to be five stations, at Foster's, Taylor's, Perryton Corners, Pre-emption and Waugh's Mills. The road is said to be well built, and is being laid with 50-pound steel rails; it is to be used chiefly for coal traffic. The track is now laid from Milan south six miles, and the road is to be finished in November.

Natchez, Jackson & Columbus.

This road is now completed to Fayette, Miss., 26 miles east by north from Natchez and two miles beyond the point last noted. It is of 3 ft. 6 in. gauge, and has been under construction for several years, the company building only as funds were secured. A new engine and passenger train have recently been received and are now running between Natchez and Fayette.

Bangor & Calais Shore Line.

At a meeting of the directors held in Machias, Me., Sept. 19, it was voted to call in 5 per cent. on all stock subscriptions, and to begin work upon the road at an early day. It was resolved to make the gauge 3 ft. 6 in., and to make the western terminus at Bangor instead of Bucksport, as heretofore proposed.

Duxbury & Cohasset.

At the meeting held in Middleborough, Mass., Sept. 20, to consider the question of extending this road it was voted to approve the proposed extension from Kingston to Middleborough and also the New Bedford connection. A committee of 13 was appointed to consider the various plans proposed, to decide upon such as shall, in their judgment, be best, and to report to a future meeting, to be called by them for that purpose. It is claimed for the New Bedford line that it would considerably decrease the cost of transporting coal to Plymouth and the towns north.

Railroads in Brazil.

An American who recently spent several months in Brazil, whose business was chiefly with the railroad companies, gives us the following information:

The principal railroads in Brazil so far constructed are of two gauges, 5 ft. 3 in. and one metre (39⅜ in.). Of the former is the principal railroad in the Empire, the "*Estrada de Ferro Dom Pedro II.*," which is some 400 miles long. It is the property of the Government, and is operated by natives. The rolling stock is: locomotives, (nearly all) Baldwins; cars, French and Belgian. Strong efforts have been made to get American cars on this road, with some prospects of success. This road runs out of the city of Rio de Janeiro, and has several branches besides the main line.

Estrada de Ferro Sao Paulo.—This is of 5 ft. 3 in. gauge. It runs from Santos to Jundiahy, and is commonly called the "English Railroad," as it is in the hands of and operated by Englishmen. The rolling stock is all English. This road runs up the mountains, the cars being hauled by wire ropes up the three sections by a stationary engine at each section.

Estrada de Ferro Paulista.—The gauge of this road is 5 ft. 3 in., and it extends from Jundiahy to Campinas. It is owned by a native company, and is managed by natives. English rolling stock is used. The company is extending its line.

Estrada de Ferro de Sao Paulo e Rio de Janiero.—This road, of 39⅜ in. gauge, is being built by an American contractor. It will run from Sao Paulo, northwest, connecting with the Dom Pedro II. Railroad, and will be completed within a few months. The rolling stock, machinery, bridges, etc., are American, as follows: Baldwin locomotives, Jackson & Sharp Company's cars, Sellers' machinery, Keystone (it is believed) bridges. When this road is completed passengers can go from Rio de Janeiro to Sao Paulo and Santos by rail, thus avoiding the sea voyage of 20 to 30 hours.

Estrada de Ferro de Stuana.—This line of 39⅜ in. gauge, runs from Jundiahy to Itu. It is the property of a native company, and is operated by natives. The rolling stock is mixed European, except the Baldwin locomotives and a few Jackson & Sharp Company cars.

Estrada de Ferro Magyana.—This line of 39⅜ in. gauge runs from Campinas to Magy-Mirim. Natives own and work it. The locomotives are English, but some of the cars were built by Jackson & Sharp Company. This company is extending its line.

The *Estrada de Ferro da Leopoldina*, of 39⅜ in. gauge, is under construction. When done it will be several hundred miles long. It has orders with the Baldwin Works for locomotives, and with W. C. Allison & Co. and the Harlan & Hollingworth Company for cars.

The *Estrada de Ferro Macahe E Campos* has lately got into financial difficulty, but is being reorganized by the Menicke Brothers, who are enterprising Americans, after which it will be consolidated with other roads they have concessions to build.

Brazil has about 2,500 miles of railroad actually built, to which they are adding very rapidly. The Government has lately decided to build extensions to the Bahia and Pernambuco railroads, which will add over 1,000 miles. It is also about to build the Rio Grande do Sue Railroad, some 60 miles in length.

A $16,000,000 contract was given out in April last to provide

the city of Rio de Janeiro with water. This city has about 400,000 inhabitants, and is as liberally provided with street railroads as any city in the world.

A large majority of the railroads in Brazil have a Government guarantee of 7 per cent. Several concessions have also been given for sugar refineries with a similar Government guarantee.

Illinois Railroad Taxation.

Springfield (Ill.) advices of Sept. 22 says:

"In the State Board of Equalization to-day the committee on railroad property made the following report on the taxable value of the track, right of way and rolling stock of all roads of the State. Some of the items on which the committee agreed for the purpose of making this report, are as follows:

Engines, $5,400 each.
Flat cars, $300 each.
Box cars, $360 each.
Passenger cars, $2,500 each.
Baggage cars, $1,050 each.
Iron rail on main track, $35 per ton.
" " " side " 28 " "
Ties, 35c. each.
Dirt ballast, $250 per mile.
Gravel " 600 "

"All the above items are for first-class roads, and a suitable deduction is made for 'run-down' roads. The property being assessed on the basis given above, it is equalized by the committee at 50 per cent. of its fair cash value, as the other property in the State has been declared to be assessed at by resolution of the board. The report has not yet been adopted by the board, but the indications are that it will be passed.

"Statement of an assessment of all railroad property denominated 'railroad, track and rolling stock':

Baltimore, Pittsburg & Chicago	$72,377
Cairo & St. Louis	288,872
Cairo & Vincennes	383,340
Carbondale & & Shawneetown	47,231
Chicago & Alton Alton & St. Louis, St L., J. & C. Joliet & Chicago	2,910,729
Chicago, Burlington & Quincy	4,333,961
Chicago, Danville & Vincennes	528,882
Chicago & Illinois River	75,154
Chicago & Illinois Southern	63,544
Chicago & Iowa	299,410
Chicago Millington & Western	14,780
Chicago, Milwaukee & St. Paul	402,386
Chicago & Northwestern	3,014,074
Chicago & Pacific	279,206
Chicago & Paducah	392,929
Chicago, Pekin & S. W	214,198
Chicago, Rock Island & Pacific	2,176,229
Chicago & Southern	59,117
Cincinnati, Lafayette & Chicago	146,713
Columbus, Chicago & Ind. Cen	191,158
Coal Valley Mining Company	19,453
Decatur, Sullivan & Mattoon	58,066
East St. Louis & Carondelet	39,720
Edwardsville	21,087
Evansville, Terre Haute & Chicago	26,214
Grand Tower Mining, Manufacturing & Transportation	138,318
Gilman, Clinton & Springfield	340,985
Hannibal & Naples	132,971
Havana, Rantoul & Eastern	66,612
Illinois Midland	651,094
Illinois & St. Louis Railroad & Coal Company	93,086
Indianapolis, Bloomington & Western	957,159
Indianapolis, Decatur & Springfield	260,047
Indianapolis & St. Louis	851,981
Iron Mountain, Chester & Eastern	107,201
Jacksonville, Northwestern & Southeastern	87,807
Joliet & Northern Indiana	82,075
Lafayette, Bloomington & Western	209,345
Lake Shore & Michigan Southern	218,178
Louisville, New Albany & St. Louis	41,537
Michigan Central	144,059
Ohio & Mississippi	1,500,196
Paris & Danville	269,321
Pekin, Lincoln & Decatur	180,382
Peoria, Pekin & Jacksonville	321,689
Peoria & Rock Island	261,200
Peoria & Springfield	35,941
Pittsburgh, Fort Wayne & Chicago	160,621
Rockford, Rock Island & St. Louis	878,343
St. Louis, Alton & Terre Haute	344,926
St. Louis & Southeastern	604,769
St. Louis, Vandalia & Terre Haute	718,974
Springfield & Northwestern	15,755
Sycamore & Cortland	11,758
Toledo, Peoria & Warsaw	882,492
Toledo, Wabash & Western	2,032,012
Union Railway & Transit Co	7,500
Western Union	413,905
Total	$28,857,138

"Under the head of 'right of way and improvements thereon,' the committee report the number of acres of land at 7,268,684, valued at (excluding improvements) $2,420,267, and the value of buildings on the same at $1,416,888. The number of miles of main track is given at (in round numbers) 6,478, assessed at $15,459,315. The number of miles of side track is reported at (in round numbers) 1,136, which is assessed at $2,239,246. The rolling stock is assessed at $7,321,422."

Waco, Fairfield & Palestine.

It is proposed to build a railroad from Waco, Tex., eastward through Fairfield to Palestine, a distance of about 90 miles. A number of meetings have been held along the line and money has been raised to pay for a preliminary survey. This survey has been commenced and is now in progress.

New Jersey Midland.

A steam-shovel and train are now at work widening the cut at Riverside, N. J., and filling in the high trestle at Hawthorne, on the opposite side of the Passaic River. As soon as this work is completed they will be employed in filling in the long trestle at Hackensack. Much ballasting has been done this season, and the road-bed and track are now in better order than ever before. Several new passenger cars have been put on the road recently.

Columbus & Southeastern.

A company by this name has been organized in Ohio to build a railroad from Ashville east by south to Murray City in the Hocking Valley coal field. The capital stock is to be $1,500,000 and the corporators are E. T. Mithoff, E. K. Stewart, H. Toland and S. A. Fuller. The road is to be a branch of the Scioto Valley.

Cincinnati & Martinsville.

A movement is on foot to reopen this road from which trains were recently withdrawn, the bondholders, who bought it at foreclosure sale, having declined to advance any more money, as the road failed to earn its working expenses. It is said that the bondholders are willing to sell out for $100,000 and that $10,000 more will put the road in order. A committee has been appointed to secure subscriptions to the stock of a new company and a considerable amount has been promised. The road is 39 miles long, from Martinsville, Ind., to Fairland.

Baltimore & Ohio.

The Baltimore *Gazette* of Sept. 18 says: "Two suits have been instituted in the Superior Court by Attorney-General Gwinn, State's Attorney Knott and John H. Handy, counsel for the State of Maryland vs. the Baltimore & Ohio Railroad Company, to recover the tax upon the gross receipts of the road extending back to 1872, which has never been paid by the company. One suit is to recover $200,000, and the other $150,000. The appearance of John H. B. Latrobe and John K. Cowen, counsel for the company, has been entered. These suits are different from those previously entered to recover the capitation tax, and in one of which recently the State obtained a verdict."

Georgetown & Seaford.

It is said that arrangements have been made to build this projected road next spring. It will extend from Seaford, Del., eastward about 16 miles to Georgetown, and will connect the Dorchester & Delaware road with the Breakwater & Frankford and through it with the Junction & Breakwater road.

Western North Carolina.

Work on the extension of this road from Old Fort, N. C., westward, is progressing steadily. On the Swannannoa tunnel much trouble has been experienced from soft rock and water, but this section has been passed, and the excavation is now in hard rock where no timbering is required. The tunnel, which is 1,875 feet long, will probably be completed by April 1. The two smaller tunnels at Lick Log and Burgin's, are well advanced and will be completed by December. West of the Swannannoa tunnel the road is graded to within seven miles of Asheville, and will be done before the tunnel is ready. About Oct. 1 a force is to be put upon the grading in the valley of the French Broad River between Asheville and the Tennessee line.

Venice, Mt. Airy & Cumminsville.

Preliminary surveys are being made for this Cincinnati suburban road, sufficient subscriptions having been secured to warrant this commencement of work. Several offers have already been received from contractors who desire to build the road or a part of it.

Keokuk & Northwestern.

A company by this name has been organized in Keokuk, Ia., to build a railroad from that place northward to Iowa City, about 95 miles. The intention is to buy and use the road-bed partly graded several years ago by the Keokuk, Iowa City & Minnesota Company, and negotiations for the purchase have already been begun by the new company.

Cincinnati, Ohio River & Virginia.

This company has filed a certificate of incorporation in Ohio. The line is to run from Cincinnati eastward through Hamilton, Clermont, Brown, Adams, Scioto and Lawrence counties, to a point on the Ohio River opposite Huntington, West Va. The distance is about 150 miles, and the capital stock is fixed at $1,000,000. The road is intended to form an extension of the Chesapeake & Ohio to Cincinnati.

Canadian Pacific.

Advices from British Columbia speak of much excitement and ill feeling there on the railroad question. The main points which appear to be settled, as set forth during the visit of the Governor General of Canada, are the final abandonment of the railroad line on Vancouver's Island, on account of the extremely expensive nature of the line and the small benefit to be derived from it; the payment of a money compensation to the Province in consideration of such abandonment, and the payment of further compensation in consideration of delays in completion of the line on the main land. Nearly all the settlements in the Province are on Vancouver's Island, but they are provided with excellent water communications.

Transportation of Goods in Bond.

The Acting Secretary of the Treasury has issued a circular to Collectors of Customs, declaring that hereafter article 640 of the General Regulations of 1874 will be understood to require all appraised merchandise transported in bond to be either corded and sealed or placed in cars secured by Customs locks or seals, Such bulky and unwieldy articles as can be transported only on platform cars or the decks of vessels need not be corded and sealed, provided the manifests for the same describe the articles with sufficient accuracy to enable Customs officers to identify them at the port of arrival.

He has also issued a circular amending the regulations governing the transportation of merchandise to, from and through the British possessions of North America so as to provide that merchandise of domestic origin, duty paid or free of duty, may be transported from one port to another of the United States over the territory of the Dominion of Canada, with the consent of the proper authorities, by routes duly designated and bonded for such purpose. Cars must be specially appropriated for such transportation, placed under the Customs seal by an officer of the Customs at the port of departure in the United States, and remain thus sealed until they shall have passed through such foreign territory and again arrive in the United States. Collectors of Customs on the frontier may, however, allow railroad cars laden for transit through Canada to remain unsealed when such cars contain perishable merchandise or valuable animals requiring the special care of attendants during transit, and when such animals or merchandise are capable of indentification by specific description in the manifest of the car containing the same. In all other cases when it is desired to transport live stock or other merchandise through the Dominion of Canada in unsealed cars, the Collector will detail a regular or temporary Inspector of Customs to accompany such cars during the transit, the expense of which service shall be paid by the party at whose request the same is rendered.

All bulky merchandise which is incapable of being put in sealed cars may be transported on platform cars.

North Louisiana.

The incorporators named in the charter of this company met in Shreveport, La., Sept. 14, and organized the company. It was resolved to open the subscription books at once and to require all subscribers to pay in 10 per cent. at the time of subscription; balance to be payable in 20 per cent. installments, not less than 90 days to intervene between each call. It was also resolved to accept subscriptions payable in unencumbered real estate, the value thereof to be fixed by appraisers. Committees were appointed to solicit subscriptions along the line.

Savannah & Memphis.

Suit is to be begun to enjoin the payment of interest or principal of $65,000 bonds issued by Columbus, Ga., in aid of this road. The grounds upon which the injunction is asked are that the subscription which the city was authorized to make was to the Opelika & Talladega road, which was subsequently reorganized and the present company formed, and it is claimed that such reorganization and change of name invalidated the subscription.

North & South, of Georgia.

A movement is on foot in Columbus, Ga., to begin suit to enjoin the payment of interest or principal upon the $200,000 bonds issued by the city in aid of this road. It is claimed that under the present constitution of Georgia no authority is vested in the city to raise money for the purpose.

ANNUAL REPORTS.

Connecticut & Passumpsic Rivers.

This company owns a line from White River Junction, Vt., northward to Derby Line on the line between Vermont and the Province of Quebec, 110 miles, and it leases the Massawippi Valley road, which extends its line from Derby Line north by east to the Grand Trunk at Sherbrooke, P. Q., 35 miles, making 145 miles worked in all. It has also leased during a portion of the year and in connection with the Boston, Concord & Montreal Company, the Southeastern Railway of Canada, from Newport, Vt., to St. Johns, P. Q., the accounts of which are kept separately. The present report covers the year ending June 30, 1876.

The equipment consists of 27 engines and 7 snow-plows and gougers; 21 passenger and baggage and 2 mail cars; 660 freight cars; 20 gravel, 3 crane, 2 boarding and 102 push, hand and wood cars.

The capital account at the close of the year was as follows:

Capital stock ($19,779 per mile)	$2,176,700 00
Bonds ($9,836 per mile)	1,082,000 00
Coupon notes ($4,886 per mile)	537,500 00
Floating debt, notes payable ($1,182 per mile)	130,000 00
Balances of accounts	35,425 75
Earnings	116,778 27
Interest	54,942 98
Reserve	343,832 14
Total	$4,476,179 00

The company guarantees $400,000 Massawippi Valley bonds and agrees under the lease to pay the same dividends on the $400,000 stock of that company as it does upon its own stock. There are $270,500 bonds and $407,500 notes which fall due Dec. 1, 1876, to meet which the company has on hand $152,500 bonds in the sinking fund and $688,500 unissued bonds due 1893. Against the floating debt may be offset cash and cash items amounting to $97,029.86. The company owns $350 000 Missisquoi & Clyde Rivers bonds, $221,131.17 Southeastern Railway notes, $13,600 Mt. Washington Railroad stock, $2,500 Montpelier & Wells River stock and a hotel at Newport, Vt., which is valued at $60,493.30.

The work done for the year was as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passenger train mileage	249,468	225,240	Inc.. 24,228	10.7
Freight " "	129,517	172,894	Dec.. 43,377	25.1
Service " "	4,568	10,447	Dec.. 5,879	56.5
Total	393,553	408,581	Dec.. 25,028	6.1
Passengers carried	172,938	183,754	Dec.. 10,816	5.9
Passenger mileage	5,170,347	.....	.....	...
Tons freight carried	127,888	176,280	Dec.. 48,392	27.4
Tonnage mileage	6,805,104	7,826,758	Dec..1,021,654	13.1
Average passenger train load	20.7	.....	.....	...
" freight " "	52.5	45.3	Inc.. 7.2	15.9
Average receipt per passenger per mile	4.93 cts.	.....	.....	....
Average receipt per ton per mile	5.08 "	5.07 cts.	Inc.. 0.01 ct.	....

Of the passengers carried 102,111 were local and 60,827 through. Mileage tickets covering 203,450 miles were sold.

The earnings from this traffic were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$254,824 87	$271,632 57	Dec..$16,807 70	6.2
Freight	345,628 22	397,093 27	Dec.. 51,465 05	13.0
Mails and express	29,959 50	30,251 21	Dec.. 291 71	0.9
Rents	7,141 28	7,776 60	Dec.. 635 32	8.1
Total	$637,553 87	$706,753 65	Dec..$69,199 78	9.8
Expenses	396,599 32	482,644 06	Dec.. 86,044 74	17.8
Net earnings	$240,954 55	$224,109 59	Inc ..$16,844 96	7.5
Gross earn. per mile	4,396 92	4,874 16	Dec.. 477 24	9.8
Net " "	1,661 76	1,545 58	Inc.. 116 18	7.5
Per cent. of expenses	62.21	68.29	Dec.. 6.08	8.9

The decrease in earnings is due to general depression of business and especially in the lumber trade. The decrease in expenses was secured by strict economy and careful attention to management. Payments for interest amounted to $139,-715.80, leaving a net balance of $111,388.75. This would have paid a dividend of 4 per cent., but it was deemed best to use it to reduce the floating debt.

The road, bridges and buildings have been fully maintained; 754 tons of new rails, 6,395 repaired rails and 62,754 new ties were used in repairs. The damage done by the freshet of May last proved less than was expected and has been fully repaired.

The report says: "The lease of the Southeastern Railway to the Passumpsic road, in which the Boston, Concord & Montreal Railroad are jointly interested, expired on the 15th of last March. This lease has not been renewed, but has been practically continued, and the road is now operated on the same basis as it was last year. Owing to the delay in completing the road from Sutton Junction to Sorel, on the St. Lawrence River, this lease has not proved so profitable as we had hoped. * *

"There now remains only about 20 miles to be constructed to complete the entire line. This forms a part of the Southeastern road, and is covered by our lease. When completed, we shall be able to run our cars direct to the St. Lawrence River at Sorel, which will open up to us a large bark and hay country having heretofore had no outlet by rail, as well as the pine lumber district of Ottawa and Michigan; all of which lumber now passes directly by Sorel, up the Richelieu River into Lake Champlain. We shall then feel warranted in looking for a large increase of business to the line of road. and a more favorable result from the lease. We are assured by Colonel Foster, who has just returned from England, that he has obtained the means to put in the remaining 20 miles of road, and he is confident of having it completed before Winter."

Memphis & Charleston.

This company owns a main line from Memphis, Tenn., eastward to Stevenson, Ala., 271 miles, and its trains run over the track of the Nashville, Chattanooga & St. Louis road from Stevenson to Chattanooga, 39 miles. It owns and works also branches from Moscow, Tenn., north to Somervilie, 13 miles, and from Tuscumbia, Ala., north to Florence, 6 miles, making 290 miles owned.

For the fiscal year ending June 30, 1876, the earnings were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Freight	$514,160 42	$523,396 68	Dec.. $9,236 26	1.8
Passengers	420,090 52	444,879 94	Dec.. 24,789 42	5.6
Express and mails	60,551 24	65,268 05	Dec.. 4,716 81	7.2
Rents	38,564 73	29,782 14	Inc... 8.782 59	29.5
Total	$1,033,366 91	$1,063,326 81	Dec.. $29,959 90	2.8
Working exp's	638,483 29	785,830 02	Dec.. 146,346 73	18.8
General expenses and taxes	47,821 01	78,991 03	Dec.. 31,170 02	39.5
Construction and equipment	25,832 19	15,011 46	Inc... 10,820 73	72.1
Total exp's	$712,136 49	$879,832 51	Dec..$167,696 02	19.1
Net earnings	$321,230 42	$183,494 30	Inc...$137,736 12	75.0
Gross earn'gs per mile	3,563 33	3,666 64	Dec.. 103 31	2.8
Net earn. per mile	1,107 69	732 74	Inc... 474 95	75.0
Per cent. working expenses	61.79	73.90	Dec.. 12.11	16.4
P. c. all expenses.	68.91	82.74	Dec.. 13.82	17.7

The decrease in working expenses is notable. The equipment has been kept in good order and is sufficient to meet any probable demands of traffic. The road-bed, track and bridges have been improved during the year and are now in good condition. During the year 19.7 miles of new fish-bar rail and 100,600 new ties were put in the track. The company has expended about $23,000 on the extension through Washington street to the levee in Memphis.